CSC 433/533 Computer Graphics  
SDSM&T Course Syllabus for Fall 2010

Course: CSC 433/533 Computer Graphics  
Prerequisite: CSC 300 Data Structures and Math 225 Calculus III  
Room: McLaury 313  
Time: MWF 9:00-9:50AM  
Website: [http://www.mcs.sdsmt.edu/csc433](http://www.mcs.sdsmt.edu/csc433)  
(Hearn and Baker, Prentice Hall, 2004).

Instructor: Dr. Weiss  
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Office Hours: MTWTh noon-1:00PM, or by appointment

SDSM&T Course Catalog Description

CSC 433/533 Computer Graphics  
(3-0) 3 credits. Prerequisites CSC 300 and MATH 225. Graphical programming concepts. Display media and device characteristics. Point, line, and circle plotting. Coordinate systems and transformations. Polygon clipping and filling. Spline methods, hidden surface elimination, and shading. Students enrolled in CSC 533 will be held to a higher standard than those enrolled in CSC 433.

Prerequisites

CSC 433/533 is an upper-level Computer Science elective course. Success in this class requires the programming maturity that comes from significant prior computer programming coursework (including a class in Data Structures). Students must have experience in writing substantial computer programs, with a working knowledge of recursion, pointers, dynamic memory management, fundamental data structures and algorithms, and object-oriented programming (including class inheritance) in C++.

Computer Graphics is a mathematically-intensive area of Computer Science. Students should have a solid mathematics background, including college algebra, trigonometry, vector and matrix manipulation, and calculus through partial derivatives and multiple integrals.

Topics

1. Introduction to computer graphics hardware and software  
2. Graphics primitives: points, lines, polygons, simple curves  
3. Region fill algorithms  
4. 2-D viewing: coordinate systems, geometric transformations, clipping  
5. Complex curves: splines, Bezier curves, fractals  
6. 3-D viewing: object representations, geometric transformations, projections  
7. Hidden-line and hidden-surface algorithms  
8. Light sources, shading, ray tracing  
9. Color models  
10. Animation
Course Requirements
1. programming assignments (3) 30%
2. group project 20%
3. midterm exam 20%
4. final exam 30%

Software
CSC 433/533 is a programming-intensive course, so be prepared to spend many long hours struggling with the computer this semester. We will be using the C++ programming language together with the OpenGL graphics library for programming assignments. The GNU C++ compiler may be used on both Linux (available in the PC Lab in McLaury 215) and Windows (using VMware or MinGW). You may wish to install at least one of these development systems on your home PC (the software is free).

Grading
Letter grades will be assigned at the end of the semester, based on the weighted scoring system outlined above. Note that programming assignments have a significant impact upon your final grade. In general, you will be allowed to work in teams of two on these assignments. To pass the course, you must successfully complete these assignments as well as pass the exams.

Your final program will be a group project. In addition to implementing an advanced computer graphics technique of your choice, you will give an oral presentation of your work to the class, and submit a written report.

There is no “late policy” in this class. All assignments must be turned in by the due date, otherwise they will not be accepted. To receive full credit, programs must not only be correct, but must adhere to good programming style guidelines (standardized formatting, meaningful identifiers, modular code, good documentation, etc.). Program grading policies are further discussed in the Programming Guidelines handout.

Academic Integrity
Although you may exchange ideas with your classmates, you must complete these assignments by yourself (or with members of your team, in the case of group projects). In particular, it is forbidden under any circumstances whatsoever to exchange source code with your classmates. COPYING CODE IS A SERIOUS INFRINGEMENT UPON THE SDSM&T ACADEMIC INTEGRITY POLICY, AND WILL BE TREATED ACCORDINGLY. Academic integrity policies are further discussed in the Academic Integrity agreement, which all students must accept to take this course.

Attendance
Attendance is required for all courses at SDSM&T. You are responsible for the lecture material as well as the assigned readings in the textbooks. The lectures may diverge significantly from the assigned readings, so good attendance is particularly important in this class. Attendance policies are further discussed in the Classroom Conduct handout.

Electronic Devices Policy
Notebook computers may be used to take notes, but not for answering email, browsing the Web, or other non-course related activities. No other electronic devices may be used during class time. Please be sure to turn off cell phones and pagers before class starts.
Objectives
The primary objective of this course is to give the student an introduction to the theory and practice of computer graphics. The basics of computer graphics hardware and software will be presented, along with a survey of advanced methods.

Outcomes
Upon completion of this course, students will obtain the following outcomes:
- basic understanding of computer graphics hardware
- working knowledge of standard computer graphics software
- understand and implement simple parametric curves (points, lines, polygons, ellipses)
- understand and implement more complex curves (splines, Bezier curves, fractals)
- understand and implement region fill techniques (flood fill, scanline fill, polygon fill)
- understand and implement 2-D viewing pipeline (geometric transformations, windows, viewpoints, clipping)
- understand 3-D viewing pipeline (hidden lines and surfaces, transformations, projections, clipping)
- understand color models, lighting models, shading, ray tracing
- understand fundamentals of animation
- experience writing OpenGL programs
- greater understanding of the software development process
- experience working in teams

The following statements must appear on all SDSM&T course syllabi:

ADA Statement
Students with special needs or requiring special accommodations should contact the instructor (John Weiss, 394-6145) and/or the campus ADA coordinator (Jolie McCoy, 394-1924) at the earliest opportunity.

Freedom in Learning Statement
Under Board of Regents and University policy, student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact the dean of the college which offers the class to initiate a review of the evaluation.