

## CSI 494 – SpTp: Computer Graphics – Spring 2009

**Instructor:** Dr. Shaun D. Ramsey   **Email:** sramsey2@washcoll.edu  
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**Office Hours:**                               M 11:30, T 10:30  
  W 11:30-12:20

**Class meetings:** TR 11:30pm-12:45 - Dunn N106

**Text:** Open GL Programming Guide:  
by OpenGL ARB, Shreiner, Woo, Neider and Davis

**Web:** <http://shaunramsey.com/494>

**Overview:** The field of computer graphics is prevalent in much of pop culture, medicine, and throughout emerging technologies. The fundamentals of most graphics systems use similar transformations, viewing and modeling methods. The fundamentals of computer graphics rely heavily on computer science and mathematics. As efficiency drives the limit of computer graphics, intense focus on data structures, memory coherence, machine-level programming languages and other programming techniques are prevalent in advanced computer graphics. As such, graphics is a great way to encourage students to learn more about these topics in an exciting field.

**Topics:** In this course, we will cover the fundamentals of graphics pipelines and programming. Students will learn basic graphics concepts such as line drawing algorithms, z-buffers, double buffering, transformations, viewing, color, lighting and texturing. In this course, students will learn the complexities of coding a rasterizer by hand and then enjoy the benefits of modeling in OpenGL. Students will gain a simple working understanding of matrices and vectors, especially as they pertain to graphics and graphics hardware.

**Advising:** As there is roughly one assignment a week and a programmed capstone project, strong programming skills are required to take this course. Knowledge in linear algebra or multi-variable calculus is useful (for matrices and vectors) but is not a prerequisite. This course is not recommended for those students who consider themselves weak in programming or weak in mathematics.

**Grading:** Your grade consists of two exams, assignments, and a final project.

You must pass each exam, the final project and have a passing average on assignments to pass the course. Each exam is worth 25% of your final grade. The final project is valued at 25% and lastly, coursework/homework comprises the last 25% of your final grade. Attendance can have an affect on your final grade (see below).

**Assignments and Programming:** Assignments largely consist of programs completed outside of class, but may include other assigned tasks inside and outside of class. For example, quizzes, oral presentations during class and specific written assignments outside of class. For programming assignments, credit is given only for programs which compile without errors, execute properly, and are not late. Late homework will receive a grade of 0, but will be collected for mark-up. Assignments are due at the beginning of class on the assigned due date. Programming assignments are time stamped by the server we will be using, so be sure not to alter your program after the hand-in time. Don't grab code from outside sources.

**Exams:** Tentatively, exams will be held on T 10/2 and T 11/13. There will be no 'final exam' during final exam week. An absence on the day of an exam will result in a grade of a 0. Except in cases of extreme emergency, exams must be taken on the day the exam is administered. Before a make-up test is scheduled, documentation of the extreme emergency must be given. Make-up exams for tests missed due to an extreme emergency will be arranged for a time that is mutually convenient for the student and Dr. Ramsey.

**Attendance:** You may miss three class meetings before a missed lecture begins to impact your final grade. Each missed class meeting after the third (for any reason) results in the reduction of your final grade by a letter grade (or 10%). It is your responsibility to obtain assigned homework, announcements and class notes from your fellow students. Talk to classmates for class notes. It is important that you attend every class, as there is certainly a correlation between grades and attendance. As a matter of courtesy, students are expected to inform Dr. Ramsey of the reason for any absence. There is no distinction between excused and unexcused absences.

**Academic Honesty:** You are always subject to the Honor Code of Washington College. You may discuss concepts with others, but work is to be done on your own (unless otherwise designated). If you are unsure if something is

considered *cheating*, simply ask. As always, if you have questions, feel free to email or stop by my office. SHARING CODE OR GIVING CODE IN ANY WAY IS CHEATING!

**Accommodations:** If you have a special accommodation/need that has been reported to the college, please let me know discretely during the first week, so that I can work to meet your accommodation.

**Suggestions:** To become a good programmer and problem solver, you must work on many problems. If you need help, please see me. The website will also be your source for topics covered, new assignments, and other resources, so be sure to utilize that aid.

### **Tentative Schedule (by week):**

1. Introduction, Pipeline, Event-based Programming
2. Scan Conversion Techniques (line and circle algorithms)
3. Command Line Programming, Vectors, Timing Techniques
4. Vector Review, Dot Product
5. Polygon Clipping and Filling
6. Transformations, 2D Matrices
7. 3D Matrices, Homogeneous Coordinates
8. Orthonormal Basis, View Projection (UVW), Perspective Transformation
9. 3D OpenGL, Basic Lighting Calculations
10. Advanced Lighting Calculations
11. Robot Code and Demonstrations
12. Fog and Fog Calculations
13. Texture and Final Project Work
14. Presentations

### **Tentative Exam and Assignment Schedule (by week):**

1. Compilation and Setup
2. Mouse and Keyboard Event Setup
3. Line Scan Conversion
4. Line Clipping
5. Command Line and OpenGL Clipping
6. Exam #1
7. 2D Polygon Scan Conversion
8. 3D Polygons and Matrix Manipulations
9. Complex Mesh, Material and Lighting
10. Project Proposal Draft
11. Project Proposal
12. Exam #2
13. Project Proposal Demonstrations - Demonstration of Progress
14. Final Project Presentations