Introduction to Computer Graphics
Computer Science 470
Lane Department of Computer Science and Electrical Engineering

Course Syllabus

Instructor: *Don McLaughlin*
Email: *Don.McLaughlin@mail.wvu.edu*
Telephone: *(304) 293-0388*
Office: *G11C Chestnut Ridge Research Building*

Office hours: *11:00 AM –Noon Monday, Wednesday and Friday (other hours available by appointment)*
Location: *G11E Chestnut Ridge Research Building (other locations by arrangement)*

Class Meeting: 2:00 PM – 2:50 PM MWF – ESB 201

Course Abstract: This course is an introduction to computer graphics, with an emphasis on interactive 3D computer graphics. The course will cover the general principles, methods and technologies associated with planning; designing and implementing interactive graphics based software and systems. Much of the course will focus on learning and using OpenGL to implement these computer graphics ideas and principles.

Course Goals: The goals of this course are that, at the completion of the course and the activities that are part of the course, the successful student should:

- Have an understanding of the general principles behind computer graphics, the technologies employed to realize computer graphic systems, and the mathematics and algorithms needed to create computer graphics software.
- Understand the general principles of designing interactive computer graphic software.
- Be able to design, code and implement computer graphics software in OpenGL.
- Understand how to model physical and conceptual objects and systems and represent them with computer graphics based visualizations.
- Be able to use computer graphics software for 3D design and visualization.

Knowledge and skills developed in this course will be demonstrated by students through the completion of homework, the completion of course projects, the performance of project demonstrations, performance on course quizzes and examinations and participation in class discusssions.

Course Prerequisites: knowledgeable in C++/C programming; also CS 220 and CS 111.

Course Topics: Generally, this course will cover and discuss the topics listed below. The actual topics covered may evolve somewhat over the semester based on the need to elaborate on specific issues and subtopics.

- Overview of course, course syllabus and requirements
- 3D Graphics applications. Hands-on with 3D modeling and visualization
- Graphics principles, concepts and methods; modeling
- Quickstart in using OpenGL
- Introduction to graphics programming
- Creating and transforming 3D objects and scenes
- Viewers and viewing 3D graphics
- Lighting and Shading
- Shaders
- Mapping and textures
- Modeling

Course Format: This course will be conducted, to a large degree, in a lecture/discussion format. Primarily that means that the course requires an engaged participation on the part of the student. In addition to assigned readings, lectures and exercises, learning will occur through active discovery, discussion and independent investigation. On occasion class lectures and discussion may be conducted remotely via ecampus or other on-line tools.

Note: This is a dynamic document. This document and some of its linked documents will change periodically throughout the semester. Students should check the course site on ecampus on a regular basis for updates and revisions to this and other course materials.

Course Requirements: Students must read and study identified reading materials and course resources on a weekly if not daily basis. Students will also meet with the class at scheduled weekly meeting times, as well as participate in course discussions and activities. Additionally, students must complete and submit to the instructor or satisfy the following:

- 8 homework assignments/projects
- 4 short “chapter” quizzes
- A mid-term exam
- A term project with demonstration
- A final Exam

Term Project: Using OpenGL each student will independently design, develop, test and submit an interactive computer graphics program with the following characteristics (these are tentative specifications, more detailed specifications will be provided later):

- A scene containing-
    - A background containing an appropriate texture map
    - A surface (floor, ground, etc.) appropriately colored or texture mapped.
    - At least five stationary objects (i.e. house, trees, fences, etc.).

    - At least one of the stationary objects must have two or more manipulable (under user control) component objects.
    - At least one movable object (for example, car airplane, train) that must be capable of moving on a non-linear path under user control.
    - At least one animated character that must be able to move with at least somewhat realistic joint/limb movements.
    - A pop-up window (under user control) to display "important textual information (i.e. status of an event, position of an object). An alternative would be a static side panel but the contents would have to be changeable depending on the user selected context.
- The project must be submitted to the instructor with appropriate user documentation and a brief description of what the project is and what it is supposed to do.
- The project will be demonstrated to the class at the end of the semester.

Alternative proposals for a final project may be considered, but they must be comparable in scope and complexity.

Performance Evaluation: Student performance in this course will be evaluated based on the successful completion of all course projects and assignments, active engagement in course discussions and activities, and the results a mid-term and final examination.
In general, the planned course activities, assignments and examinations and their respective point values in determining the final grade in the course are:

Activity or Task	Max Point Value	Total Points Possible
Homework Projects	15 (*8)	120
Quizes	20 (*4)	80
Mid-term exam	100	100
Term Project	100	100
Final Exam	100	100
Total		500

Homework will be due by the posted date and time as assigned. Homework assignments will not be accepted after the assigned deadline, unless there is a prior arrangement with the instructor.

The overall course performance will be determined based on a total of the points for the activities or tasks described above. A final letter grade will, then, be assigned based on the following table:

Point value	Earned Letter Grade
>=450	A
399>450	B
349>400	C
299>350	D
<300	F

Attendance Policy: Class attendance is not required. However, students are encouraged to attend and participate in class lectures and discussions, and should note that students will be responsible for course material and information that may be conveyed through lectures and class discussion whether or not that material or information is contained in handouts, instructor provided notes, or assigned or optional readings. Students should also note that a significant portion of the course content will be conveyed through class lectures, in-class activities and class discussions.

Important note: Missed quizzes may not be made up. Exams may only be made up with an excused absence, which must be requested and approved before the exam.

Academic Integrity Policy: The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code (http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code). Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.
Students are expected to adhere to all University standards for academic integrity and honesty. Please see the WVU statement on Academic Integrity. Unless instructed otherwise students may confer with each other to identify resources for problem solutions, test preparation and project development. However, all students are, unless instructed otherwise, required to carryout homework assignments, take examinations and complete class projects independently. Copying and submitting the work of others, in part or whole, or the use of unapproved reference materials during examinations will be considered a violation of this course's academic integrity policy. Any single violation of the academic integrity policy by a student will result in an automatic score of zero for the activity in which the violation occurred. A second violation by the same student may result in a grade of F for the course for that student. Students are responsible to refrain from sharing homework, test responses and project components with others students. In cases where students submit the work of others, whether homework, test responses or projects, both the originator and the submitter may be charged with an academic integrity violation.

Students are also expected to adhere to conventional standards regarding the published and unpublished works of others. In particular, all works of others used by students in this course must be appropriately attributed and cited.

Electronic Communications Policy: WVU MIX email addresses will be the official email addresses used in this course. All email communications between the instructor and class participants (individually or the class as a whole) will be done using MIX addresses. Homework or project submissions made using something other that WVU MIX and not received by the instructor will be treated as "not-submitted". Note: most assignments should be submitted through **eCampus**.

All student email must use their WVU assigned email ID for all email communications and homework/project submissions.. Nicknames or pseudonyms (such as those used by outside email services) may not be used. For example, SMARTGUY9356@XYZMAIL.COM is not appropriate sender identification.

eCampus and the respective eCampus site for this course will be the official website for this course. This eCampus site will serve as a core communications facility for this course. Students should log-on and check this website on a daily basis. Students are also advised to check their email every day. Notices, announcements and course related information will be disseminated through email or on the eCampus course site.

Inclusivity: The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.

Homework and Project Submissions: All homework, reports and project submissions must (unless previously approved or directed by the instructor) be done through this course's eCampus website or by electronic mail as instructed by the instructor. All course material email submissions must include the course name (CS470) and the specific submission title in the subject line of the email message. For example, homework exercise number one would be submitted with **CS470 Homework 1** as the subject line. The submission, then, will typically be included as an attachment or uploaded.

Required Text:

Interactive Computer Graphics: A Top-Down Approach with Shader-Based OpenGL, 6/E
Edward Angel, *University of New Mexico* & Dave Shreiner, *ARM, Inc.*, ISBN-10: 0132545233 • ISBN-13: 9780132545235 , ©2012 • Addison-Wesley • Cloth, 768 pp
Published 03/31/2011

Additional Valuable Resources and Reference Materials:

OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 4.3 (8th Edition), Dave Shreiner (Author), Graham Sellers (Author), John M. Kessenich (Author), Bill M. Licea-Kane (Author), **ISBN-10:** 0321773039, **ISBN-13:** 978-0321773036, Addison-Wesley Professional; 8 edition (March 30, 2013) (Red Book)

OpenGL SuperBible: Comprehensive Tutorial and Reference (6th Edition), Graham Sellers (Author), Richard S Wright (Author), Nicholas Haemel (Author). **ISBN-10:**

0321902947 | ISBN-13: 978-0321902948, Addison-Wesley Professional; 6 edition (July 31, 2013)

Schaum's Outline of Computer Graphics, Zhigang Xiang (Author), Roy A. Plastock (Author), ISBN-10: **0071357815** | ISBN-13: **978-0071357814, McGraw-Hill; 2 edition (September 8, 2000)**

OpenGL Reference Pages at OpenGL.org (Blue Book?), http://www.opengl.org/sdk/docs/man/

Others: to be announced.

Course Lectures and Notes:

Course lectures, notes and other materials may be found under the Course Materials section on eCampus. Please be aware that these files may be Powerpoint, pdf, or HTML files. They may also be MS Word files. Download them for local viewing.