CS 535 Computer Graphics

Syllabus

(Fall 2025)

Required/Elective: Elective

Prerequisites: CS315, CS335, (CS321/CS322)

Syllabus (Fall 2025)

General Information

Topics Covered

Computer Facilities

Grading Policy

Course Summary & Program Outcomes

Plagiarism & Cheating

Important Dates

General Information

Location: Mine and Minerals Research Bldg, Rm 112

Time: TR 12:30 – 1:45pm

Instructor: Dr. Fuhua (Frank) Cheng

OFFICE: DMB 303

OFFICE HOURS: TR 3:30pm-5:30pm
and by appointment

PHONE: (859) 257-6760

E-MAIL: cheng@cs.uky.edu

General Information

CLASS WEBSITE:

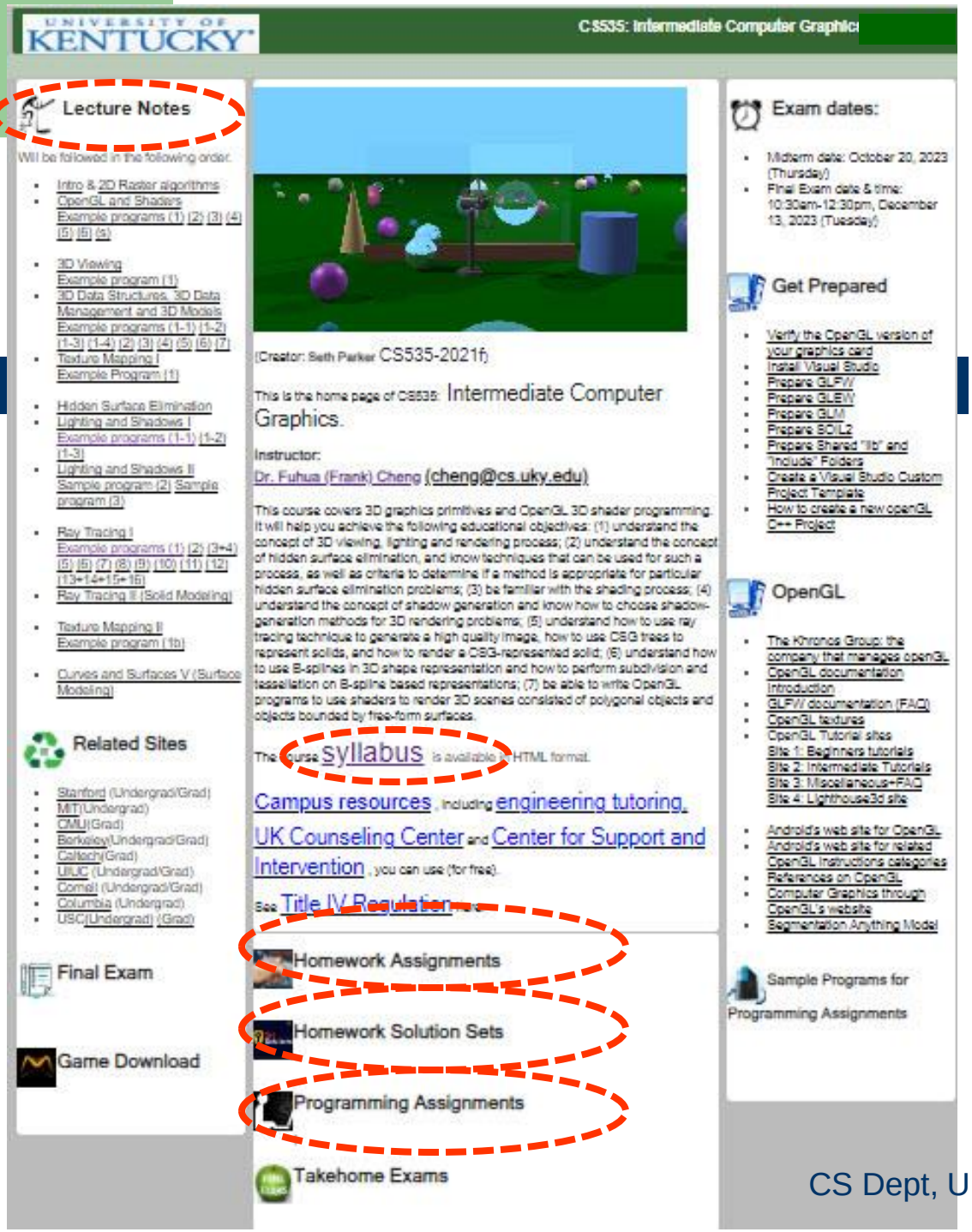
http://www.cs.uky.edu/~cheng/cs535/CS535-HomePage-2025f.htm

Or, go to my personal WEBSITE first:

http://www.cs.uky.edu/~cheng/

Then scroll down to 'Teaching' and click on 'CS 535'

CLASS WEBSITE:



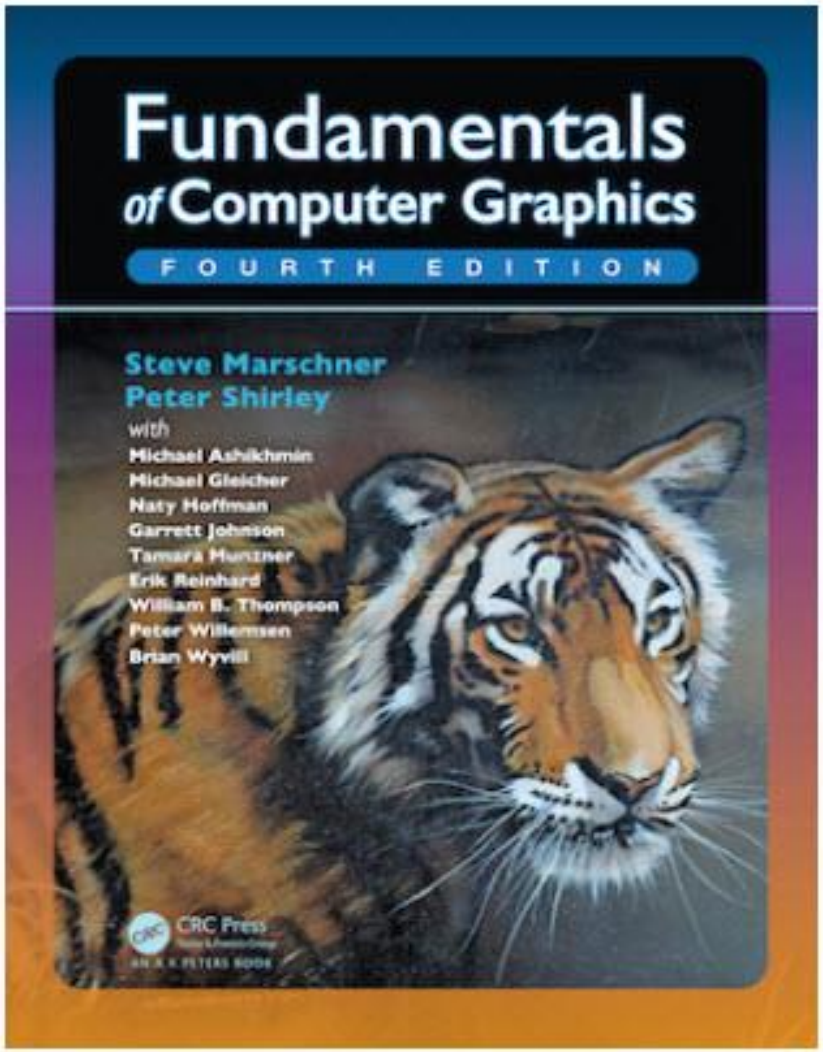
General Information

TEXTBOOK: Fundamentals of Computer Graphics (5th Edition)

by Steve Marschner and Peter Shirley

(publisher: A K Peters/CRC Press)
(ISBN-10 : 0367505037 **ISBN-13 :** 978-0367505035)

and my notes (can be downloaded from the class website)



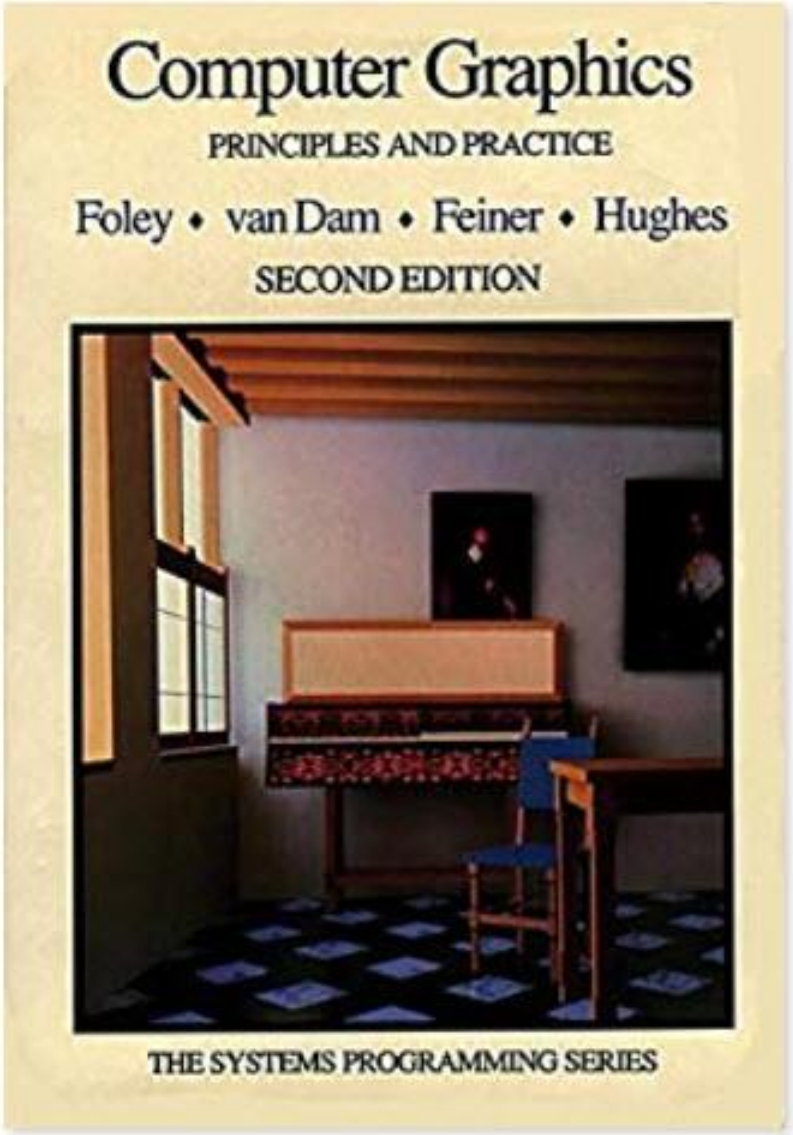
General Information

REFERENCE BOOKS:

Computer Graphics: Principles and Practice,

2nd edition in C

by Foley, van Dam, Feiner, and Hughes



General Information

REFERENCE BOOKS:

COMPUTER GRAPHICS PROGRAMMING

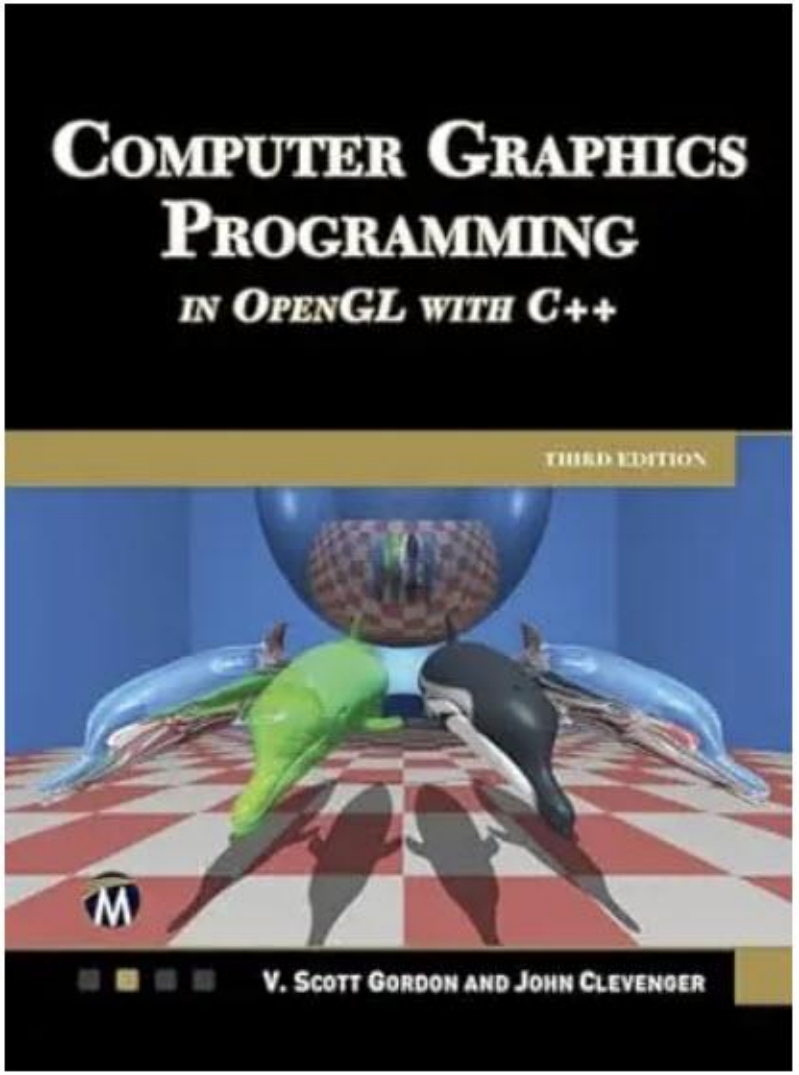
in OpenGL with C++

3rd Edition

by V. Scott Gordon

and

John Clevenger



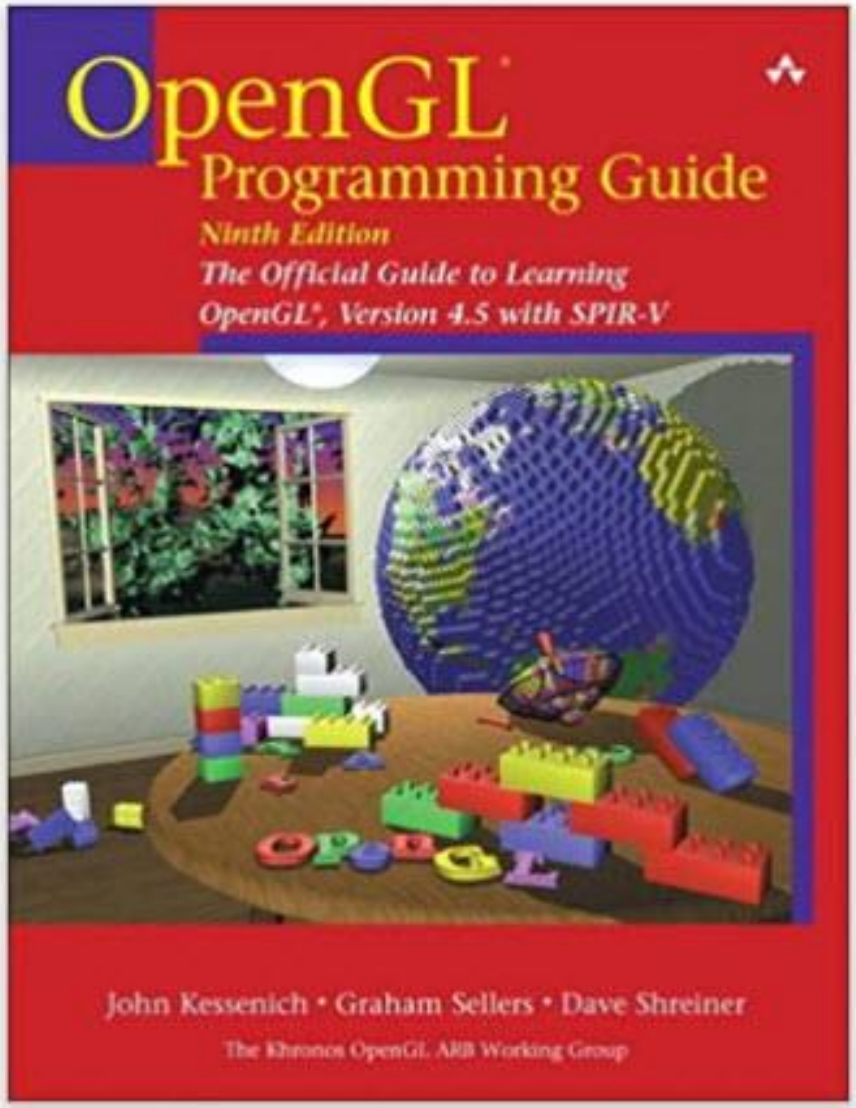
General Information

REFERENCE BOOKS:

OpenGL Programming Guide: The Official Guide to Learning OpenGL,

Versions 4.0 (8th Edition)

by Dave Shreiner, Graham Sellers, John Kessenich, Bill Licea-Kane



List of Topics:

Weeks 1:

Basics: graphics systems, modeling, rendering, input and interaction

2D Graphics: concept of RGBα and rasterization of polygons

Weeks 2-3:

OpenGL and Shaders: basic structure, utility libraries, callback function prototypes, examples

List of Topics:

Week 3-4:

3D Viewing: projections, geometric transformations, graphics transformation

Week 4-5:

3D Data Structures, 3D Data Management and 3D Models: face-table based, winged-edge data structure, scene graphs, Managing 3D data, and 3D models

Weeks 6:

Hidden Surface Elimination: overwriting, backface culling, Z-buffer, scan-line method, BSP-tree method

List of Topics:

Weeks 7-8:

Illumination, Shading (lighting) and Shadows: Gouraud shading, Phong shading, shadow volume method, shadow map method

Weeks 9-10:

Ray Tracing I: ray tracing, shadow generation, specular reflection, refraction, instancing

Weeks 10-11:

Ray Tracing II: Solid modeling, ray casting

List of Topics:

Week 12:

Texture Mapping:

Week 13-14:

Curves and Surfaces:

Computer Facilities:

You can either use your own computer or the computers in the Multilab to do programming assignments for this class.

Your userid for the Multilab will be mailed to you during the first week of the semester. If you did not get it, please send me email so I can send your userid to you again.

This is a Linux laboratory administered by the Computer Science Dept.

Computer Facilities:

Lab Location: Hardyman Building

You may use alternative computer systems for developing and testing your work. But your submitted work must compile and run under the proper software environment.

This course uses OpenGL to support graphics operations.

Get Prepared:

- Follow the instructions given underneath “Get Prepared” to install all the header files and things you need for this class

Grading Policy:

Programming Assignments (3 assignments)---- 40%

Midterm ----- 20%

Final ----- 20%

Class attendance (extra credit) ----- 5%

Homework (6-8 assignments)----- 20%

- You get the attendance credit (5 points) if you miss at most two lectures in the semester

Grading Policy:

** Programming assignments may be done in C++. Example programs in C++ will be provided.

*** You may use ChatGPT or any GAI to help with your HW or programming assignments.

LATE PENALITY:

I will accept programs and homework up to two days late for a penalty of 20% (10% each day).

Grading Policy:

SCALE (graduate students):

90 -105 .... A

80 - 89 ..... B

70 - 79 C

SCALE (for under-graduate students)

86 -105 .... A

76 - 85 ..... B

66 - 75 C

56 - 65 ..... D

0 - 55 ..... E

Course Summary & Program Outcomes:

This course covers 3D graphics primitives such as 3D viewing, 3D data structures, hidde line/ surface elimination, illumination and shading, and more advanced topics such as ray tracing, solid modeling, texture mappings, curves and surfaces, advanced raster graphics architecture and algorithms, and advanced modeling techniques if time permits.

Course Summary & Program Outcomes:

Specific skills:

- An understanding of the graphic system and shader programming (input devices, scan converstion, graphics storage, graphic processing unit, output devices, graphics pipeline and shaders)
- An understanding of 3D viewing (projections, geometric/graphics transformations)
- An ability to use appropriate data structures (face-table based, winged-edge data structure, scene graphs) to represent 3D objects and to manage 3D data and building 3D models

Course Summary & Program Outcomes:

Specific skills:

- An ability to apply appropriate techniques (overwriting, Z-buffer, scan-line method, BSP-tree method) to elliminate hidden lines/surfaces in 3D rendering process

- An ability to apply appropriate techniques (Gouraud shading, Phong shading, shadow volume method, shadow map method) to shade objects and to create shadows in the rendering process

Course Summary & Program Outcomes:

Specific skills:

- An ability to use appropriate mapping techniques to create textures for objects in the rendering process
- A fluency in graphic and shader (especially compute shader) programming using OpenGL as the supporting graphic system.

Plagiarism & Cheating:

Consult the following links for information on what constitutes an academic offense and on applicable penalties:

http://www.uky.edu/Ombud/

http://www.uky.edu/Ombud/Plagiarism.pdf

Important Dates:

First day of class - 8/26/2025 (Tuesday)

Last day to drop without a W or change grading option - 9/12/2025 (Friday)

Midterm - 10/16/2025 (Thursday)

Fall Break - 10/27/2025-10/28/2025 (M&T)

Thanks Giving Holidays - 11/26/2025-11/29/2025 (Wednesday-Saturday)

Last day of classes - 12/09/2025 (Tuesday)

Final Exam – 10:30-12:30, 12/16/2025 (Tuesday)

End