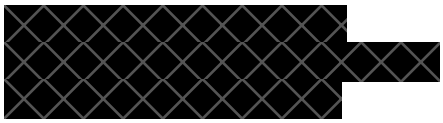
Department of Computer Science
University of Massachusetts Lowell
COMP.4270/5460 Computer Graphics I
Spring 2022

Instructor: 
E-mail:
Time:
Location: VIRTUAL

Course Description
This is an introductory course on Computer Graphics. This course focuses on the concepts and algorithms that underlie the development of modern interactive, three-dimensional computer graphics software. Computer Graphics is interdisciplinary by nature and involves not only algorithms and data structures but also mathematics, human factors, and perception. This course will involve a significant amount of programming to implement various graphics algorithms.

Learning objectives
- Learn about the history of Computer Graphics
- Conceptual Framework of Interactive Graphics
- Understand the human visual system's basic functionality.
- Understand the process of synthesizing images from objects and scenes.
- Design and implement 2D and 3D graphics algorithms, including specifically:
  - 2D drawing programs.
  - 2D and 3D transformations.
  - Parallel and perspective projections.
  - Lighting, shading, shadows.
  - The graphics pipeline.
  - Ray tracing, ray casting, radiosity.
  - Shaders, GPU programming.
- Use of graphics libraries/APIs (such as OpenGL, WebGL etc.)
- Develop web-based graphics programs.
- Read and critique papers from Computer Graphics literature for their contributions to the field.

Pre-requisites
Computing III

Required Text
- E. Angel & D. Shreiner. *Interactive Computer Graphics: A Top Down Approach with WebGL, 7th Edition*, Pearson, 2015, ISBN-13: 978-0-13-357484-5.

Additional References
- J. Foley, A. van Dam et al., *"Computer Graphics Principles and Practice," Second Edition in C*. Addison-Wesley 1996, ISBN 0201848406.
- John F. Hughes; Andries van Dam; Morgan McGuire; David F. Sklar; James D. Foley; Steven K. Feiner; Kurt Akeley. *Computer Graphics: Principles and Practice, Third Edition.* Addison-Wesley Professional, 2013. ISBN-10: 0321399528, ISBN-13: 9780321399526. Available online as a safari book through the UML Library's (proxy) web site as well as through other public libraries.

Topics/Syllabus

- Ch 1: Graphics Systems & Models
- Ch 2: Graphics Programming
- Ch 3: Interactions and Animation
- Ch 4: Geometric Objects and Transformations
- Ch 5: Viewing
- Ch 6: Lighting and Shading
- Ch 7: Discrete Techniques
- Ch 8: From Geometry to Pixels
- Ch 9: Modeling and Hierarchy
- Ch 11: Curves and Surfaces
- Ch 12: Advanced Rendering: 12.1-3

Course Schedule	**4270**	**5460**	
Quiz 1	5%	4%	[02/02/2022]
Quiz 2	5%	4%	[02/16/2022]
Quiz 3	5%	4%	[03/02/2022]
Quiz 4	5%	4%	[03/23/2022]
Quiz 5	5%	4%	[04/06/2022]
Quiz 6	5%	4%	[04/20/2022]
Literature Survey (3)	15%	12%	[various dates]
Term Paper		9%	[04/24/2022]
Programming Assignments (5-6)	30%	30%	[various dates]
Final Project	22%	22%	[04/27/2022]
Final Project Demonstration	3%	3%	[04/27/2022]
Class Attendance	0-2%		

Grading

Grades will be assigned as follows—based on the cumulative score:

A	95-100
A-	90-94
B+	85-89
B	80-94
B-	75-79
C+	70-74
C	65-69
C-	60-64
D+	55-59
D	50-54
F	< 50

Academic Policies

All work for this course must be done individually—no joint work or collaboration is permitted. Students can discuss general concepts and problems they face when they work on the assignments but cannot copy or share code. Any form of plagiarism or copying will result in a grade of F. Please be aware of the Computer Science Department and the University's policies on copying and plagiarism.