# Computer Graphics – CSE333/CSE533

**Credits**: 4

**Pre-requisites**
Linear algebra - MTH100
Algorithms and data structures, and - CSE102, CSE222
Programming in C/C++ - CSE101, CSE201

**Post Conditions**
This course will expose students to the fundamentals of computer graphics. Apart from the basics of graphics algorithms, this course will introduce the industry standard OpenGL graphics API. A student who successfully completes this course will be able to:
- apply the learned concepts to data visualization, game design, and realistic rendering,
- use shader based OpenGL API for 2D/3D rendering,
- understand spatial data structures for shape representation,
- use spatial algorithms for geometry processing and display, and
- understand the graphics pipeline and graphics hardware.

**Description**
This course will provide basic concepts of computer graphics including necessary mathematics and algorithms. Primary focus of this course will be to understand the basics of 2D/3D rendering. The course will also cover various aspects of the rendering pipeline and realistic image synthesis using raytracing. The standard shader based OpenGL rendering API will be introduced, and used with lab exercises, assignments, and projects. The students will learn building complete graphics systems through projects.

**Schedule**

| Week | Topics covered |
|---|---|
| 1 | Introduction, Graphics hardware |
| 2 | OpenGL basics and programmable graphics pipeline |
| 3 | Shape representation, Rasterization and scan conversion |
| 4 | 2D/3D transformations |
| 5 | Modelling, viewing, and projection transformations |
| 6 | Clipping |
| 7 | Visibility |
| 8 | Color |
| 9 | Lighting and shading |
| 10 | Texturing, Implicit modelling |

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| 11 | Parametric curves and surfaces |
| 12 | Raytracing, Animation |
| 13 | Advanced raytracing, introduction to global illumination, and Ambient occlusion |

**Evaluation**

This is a project based course and there will be regular project evaluations throughout the course. The students are expected to attend lectures and complete programming assignments. The course is programming intensive. The provisional breakdown for various elements is:

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| Assignments | 20% |
| Quizzes | 5% |
| Project | 30% |
| Mid-term Exam | 15% |
| Final Exam | 30% |

**Texts/Other Resources**


1. Peter Shirley, *Fundamentals of Computer Graphics*, AK Peters Ltd.
2. Andries Van Dam, Steven K. Fe
3. iner, Morgan McGuire, and David F. Sklar, *Computer graphics: principles and practice*, Pearson Education.
4. Donald Hearn, and M. Pauline Baker, *Computer Graphics*, Prentice-Hall.
5. Interactive Computer Graphics – A top-down approach with OpenGL, Edward Angel and Dave Shreiner, 6th Ed., Addison-Wesley.