Winter 2023

CSS 552: Topics in Rendering

This course focusses on high quality real-time image synthesis, for both real and non-realistic effects. The course covers the foundational mathematics required, examines modern graphics processing unit (GPU) programming model, studies algorithms, for and how these algorithms are being mapped onto the modern GPU for real-time effect rendering.

Approximated Schedule, this is a brand-new design for the course, it is expected that the following details will change accordingly.

Week	Topics	Assignment
1	Introduction + Learning tools (Unity) GPU Programming Model + Rendering Pipeline	Assign MP1: Tool Familiarization
2	Transformation and Coordinate Pipeline Simple Vertex and Pixel/Fragment Shaders	**Due MP1** Assign MP2: GPU Shader
3	Local Illumination Model (Lambert and Phone) Light Sources	**Due MP2** Assign MP3: Phong Illumination
4	Texture Mapping: • UV, Mipmap, Projection, Multi-Texturing Texture Synthesis: • 2D, Solid Noise, Noise, Normal mapping	**Due MP3** Assign MP4: Texture Shaders
5	Buffers, Multi-pass Shaders, and Blending Render Texture and Multi-pass Rendering	**Due MP4** Assign MP5: Multi-pass Shaders Assign: Final Project
6	Global Effect Approximation • Shadow, Reflection • Refraction and Caustic	**Due MP5** **Due: Final Project Proposal**
7	Final project proposal presentation Post Processing: volumetric effects, glow, flare	**Due: Final Project Presentation**
8	Examples solutions: Silhouette, Fluid, Caustic, Toon	
9	Final project progress presentation Catchup	**Due: Progress Demo**
10	Image space solution: Ray tracing Other shaders: geometric and/or displacement shader	
Final	Final Project Presentation	**Due: Final Demo**