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.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignment</th>
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| 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                |