**CSE 287  
Project - Pipeline Graphics**

Instructions:

* Your project must be an interactive program that responds to the keystrokes, as outlined in the [keystroke guide.](https://drive.google.com/open?id=1-qM_0KnSQ0QhkRFGvCXpGW3YUUUWc1-sxjhyyIvnObw) Do not deviate from these keystrokes.
* This [video](https://drive.google.com/open?id=1HmAdMjTRFSPqfF79LoYEYYOWzsL45bFW) shows the operation of completed program.
* Note: the video illustrates features that are not required in this project (i.e., viewports and decaling).
* ProjectPipeline.cpp should be used as your main driver for this assignment. It includes event handlers that capture the required keystrokes.

**(100) REQUIRED FEATURES**

1. **(25) Explicit 3D Surfaces.** Your scene must include, at a minimum, the following objects, each with their own common material property (e.g., gold). The objects in scene should be arranged to demonstrate that hidden surface removal is working properly.
   1. Cylinder with open ends. This cylinder should be displayed in two different sizes and two different alignments: aligned with Y axis and also aligned with Z axis.
   2. Cone
   3. Checkerboard floor
   4. Plane (in addition to the checkboard).
2. **(25) Viewing.** The user can walk around the scene using keystrokes (see [keystroke guide](https://drive.google.com/open?id=1-qM_0KnSQ0QhkRFGvCXpGW3YUUUWc1-sxjhyyIvnObw)). Adjust your walking speed to allow the user to take between 4 and 10 seconds to get across the length of your scene. Typing up/down arrow will change the user’s head-elevation-angle by 10 degrees. Left/right will change the user’s azimuth angle by 10 degrees. Clamp elevation angle between [-80, +80] and azimuth angle between [-90, 90], relative to the direction of travel (i.e., user can look directly left or right, but not behind themselves.).
3. **(25) Lighting and shading**. The lighting/shading of your scene must include one positional light and correctly implement the equations to render the objects with a realistic appearance.
4. **(25) Hidden Surface Removal.** The surfaces of all 3D shapes must correctly hide surfaces that are behind other objects (relative to the viewer). That is, with respect to visible geometry, the scene must appear realistic.

You must provide a report (PDF file) that contains:

* An itemized list of the functionalities that work and those that do not.
* Screenshots of your program’s display should be inserted into your report. The image should annotated to highlight the functionalities that were completed. This might include, for example, images of the scene with and without antialiasing.
* If you do not provide a report, or it is significantly inaccurate, 15 points will be automatically deducted.