Computer Graphics (Fall 2021) Course Project		
Course	**Name, ID, Section:** Computer Graphics CMPS 373 **Instructor Name:** Dr Osama Halabi	
HW Info	**Due:** **Nov 16, 2021 (TUE)** **(end of day)** **Grade:** 100 marks	_____ **100**
Student	**Student Name:** **Student ID:**	

SUBMISSION INSTRUCTION

1. **You must submit the whole project solution/project folder in one zip file so that it can be compiled and run.**
2. **Name your file as [your name]-[student ID]-CG-project**

- This is an **individual work** and the submitted work must represent your **own thinking and efforts**. Copying the work of others will not be tolerated. Similarity will be investigated and zero grade for all parties involved will be assigned.
- Submit before the due date.

Description

Now that you have some experience using OpneGL with C++ and other convenience libraries such as GLFW, GLEW, GLM, etc to create interactive computer graphics applications. You are required to develop your own 3D graphics application, but the project must satisfy the following requirements:

- Your application must render 3D images using OpenGL.
- Your application must incorporate at least 2 of the following areas of computer graphics: imaging, interaction, modeling, rendering, and animation.
- Your application must be moderately complex. This means it should have more features than the other programming tutorials and assignments in this course.

Example Projects

Listed below are some examples of acceptable final projects. This is by no means a complete list, and you should feel free to come up with your own project, but these examples demonstrate the complexity we are expecting.

- A maze mini game, Doom like game, where user will traverse through a virtual maze that is built dynamically form textual input where you can reconfigure the maze by setting the matrix of text to create the maze. The maze will be displayed from a first perspective.
- A modeling system that allows simple editing of triangle meshes and spline or subdivision surfaces (modeling) with care given to a user interface that allows all manipulations to be done intuitively (interaction).
- A Minecraft-like world that allows the user to roam a procedurally generated world (modeling) and can efficiently render large scenes (rendering).
- A game that allows the user to roam a manually specified world and has fancy shading effects (rendering) and has an interactive level editor (interaction).
- A procedural plant modeling system (modeling) with interactive control over parameters and constraints (interaction) or some fancy realistic rendering techniques (rendering).
- An artistic rendering system that simulates some traditional medium (pen-and-ink, watercolor, charcoal, ...) under interactive control (rendering, interaction).
- Physics simulation, such as a particle system, a system of rigid bodies, a deformable object such as cloth, or fluid simulation (animation), with either associated interactive authoring tools (to allow setting up initial conditions, interacting with the running simulation -- interaction) or some shading techniques for realistic results (rendering).
- A volume renderer for medical data that supports direct volume rendering (imaging) and either extraction of ISO surfaces from the volumes (modeling) or an interactive system for adjusting the rendering parameters, extracting slices, etc. (interaction).
- A tool for creating 3D animations from imported assets (3D meshes, images, etc.) that allows the user to set transformation keyframes and interpolates between them (interaction, animation).
- Helicopter game with obstacles and borders (modeling) The player should fly the helicopter and escape from the obstacles (interaction). If the helicopter hits any obstacle, then the game is over.
- 3D wall-clock with analog display (modeling) that read time from the system. The clock can have different looks and different surroundings and lighting to have special effects and different looks (rendering).
- Solar system with sun, moon, and planets. The system has nice looking considering lighting and textures (rendering) and ability to interact to see from different views (interaction).
- Racing car simulation to demonstrate moving racing car along racetrack (modeling) and scenery (rending) with option to see the car from different views (interaction).

- Implement Tower of Hanoi 3D simulation to visualize the recursive solution (animation). The user can change the views and try to solve by moving the disks himself (interaction).
- Wind energy simulation where windmills can be rotated using input from user (interaction) to generate electricity that delivered to houses and lights them up (rendering/lights) and the whole area start glowing up depends on the amount of generated energy.

Final submission:

Interview

You will be assigned a time to present your work to the instructor where you are expected to present the following:

- What are your goals for the project?
- What are the different components of your program?
- How do they relate to at least 2 of the 5 areas of computer graphics listed above?
- An explanation of your progress and what has been implemented?
- What are some of the challenges you have faced?
- What are the most technical details of your program that you are most proud of implementing?
- A live demo of your project

Project Report

Project report must include the following:

- A statement of the goals of your project
- A description of what you accomplished, which features you implemented, any how they relate to at least 2 of the 5 areas of computer graphics listed above.
- Any particular technical details that you implemented (e.g., rendering to a cube map texture, mapping mouse clicks to 3D, relevant mathematical equations, etc.).
- Any special instructions needed to run your code.
- Any resources used to create your project (external libraries, images, models, technical papers, blogs, etc.).
- What are some of the challenges you have faced?

Judging Rubric for the Computer Graphics Project
Fall 2021

Criteria	1 (Novice)	2 (Competent)	3 (Proficient)	4 (Outstanding)
Rendering	Rendering does not work properly or is not saved/rendered properly.	Rendering is average, works properly for the most part.	Rendering is done well, works properly and is saved in an appropriate file format.	Rendering is done extremely well, works properly and is saved in an appropriate file format.
Model Complexity	Model design is inappropriate or overly simplistic.	The 3D model is mostly simplistic and/or lacks evidence of sub-object modeling to define/refine modeled details	The 3D model is mostly complex and/or detailed but lacks some evidence of sub-object modeling to define/refine modeled details	The 3D model is complex and/or detailed and shows evidence of substantial sub-object modeling to define/refine modeled details
Organization	None of Objects, Materials and Textures are named	Few Objects, Materials and Textures are named	Objects, Materials and Textures are mostly named	Objects, Materials and Textures are fully named
Environment	There is no environment used whatsoever	Model is not placed in an appropriate or interesting environment (either modeled or background imaged)	Model is placed in an appropriate or interesting environment (either modeled or background imaged)	Model is placed in a highly appropriate or very interesting environment (either modeled or background imaged)
Graphic Design & Visual Appearance	3D model shows poor design qualities and is not aesthetically acceptable	3D model shows basic design qualities and is aesthetically acceptable	3D model shows good design qualities and is aesthetically pleasing	3D model shows excellent design qualities and is aesthetically pleasing
Skill Level	Poor skill level is evident	Basic skill level is evident	Very good skill level is evident	Advanced skill level is evident.
Project Guidelines Compliance	here are missing 2 or more important project requirements, or project guidelines not followed	There is a missing important project requirement, or a guideline not followed	Project guidelines are mostly complete and all required elements are present.	Project guidelines followed completely and all the required elements are present