1. **Course Number and Course Title:**

   CMP 430 – Computer Graphics

2. **Credit Hours:**

   3 – 0 – 3

3. **Prerequisites and/or Co-Requisites:**

   Prerequisites: MTH 221 Linear Algebra and CMP 305 Data Structures and Algorithms

4. **Name and Contact Information of Instructor:**

   Dr. Michel Pasquier

5. **Course Description (Catalog Description):**

   Introduces the fundamental principles and techniques of computer graphics using state-of-the-art tools. Covers viewing and ray tracing, imaging and displays, rasterization, antialiasing, intersection and clipping, triangle meshes, spline curves and surfaces, 2D and 3D transformations and projections, illumination and shading, geometric modelling, animation. Addresses topics such as human visual perception, hardware and software acceleration.

6. **Textbook and other Supplemental Material:**

   Textbook:

   - Steve Marschner, Peter Shirley, *Fundamentals of Computer Graphics,* 4th edition, CRC Press, 2016.

   Supplemental material:

   - John F. Hughes, Andries van Dam, Morgan McGuire, *Computer Graphics Principles and Practice,* 3rd edition, Addison-Wesley, 2013.
   - Farhad Ghayour, Diego Cantor, Real-Time 3D Graphics with WebGL 2, 2nd edition, Packt Publishing, 2018.
   - Dave Shreiner, Graham Sellers, et al. OpenGL Programming Guide, 8th edition, Addison Wesley, 2013.

7. **Course Learning Outcomes:**

   Upon completion of the course, students will be able to:

   1. Apply the fundamental principles of computer graphics.
   2. Describe graphic displays and the components of the graphic pipeline.
   3. Create 2D and 3D geometric transformations and projections.
   4. Model object geometry using triangle meshes and spline curves and surfaces.
   5. List and select from the different illumination and shading models.
   6. Use colors, textures, antialiasing, compositing, to enhance graphic display.
   7. Write OpenGL programs or similar to create computer images and animation.
   8. Use software tools such as Blender for modelling and rendering.

8. **Teaching and Learning Methodologies:**

   Methods include lectures, problem-based learning, class discussions, and group work. Students learning is assessed via in-class quizzes, exams, homework, and programming assignments/ projects.

9. Course Topics and Schedule:

Topic/Activity	Weeks
Introduction to Computer Graphics, applications and tools	Week #1
Viewing and raytracing, illumination and shading	Week #2
Projections, 2D and 3D geometric transformations	Week #3
Geometric modelling, scene graphs, BSPs	Week #4
Graphic pipeline, rasterization, triangle meshes	Week #5
Graphic pipeline, viewports, clipping	Week #6
OpenGL, WebGL, Three.js programming	Week #7
Imaging and displays, textures and mapping, sampling	Week #8
Antialiasing, compositing, colors – Midterm	Week #9
Geometric modelling, spline curves and surfaces	Week #10
Geometric modelling, intersections, subdivision	Week #11
Animation, double-buffering, deformations	Week #12
Animation, collision detection, game programming	Week #13
Advanced raytracing, reflection, acceleration	Week #14
Revision	Week #15
Final Exam	Week #16