1. **Course Number and Course Title:**
   CMP 430 – Computer Graphics

2. **Credits Hours:**
   3 – 0 – 3

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

4. **Name and Contact Information of Instructor:**
   Dr. Michel Pasquier
   Office: EB2-213
   Email: mpasquier@aus.edu
   Phone: (06) 515-2883
   Office Hours: as posted on *iLearn* or by appointment

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.

   Other supplemental material:
   - John F. Hughes, Andries van Dam, Morgan McGuire, *Computer Graphics Principles and Practice,* 3rd edition, Addison-Wesley, 2013.
   - Dave Shreiner, Graham Sellers, et al. OpenGL Programming Guide, 8th edition, Addison Wesley, 2013.

7. **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 tools such as POV-Ray and Blender for ray tracing and rendering.

8. Teaching and Learning Methodologies:

Methods include lectures, problem based learning methods (homework assignments, in-class quizzes, exams, and programming assignments), as well as class discussions.

9. Course Topics and Schedule:

Topic	Weeks
Introduction to Computer Graphics, Applications and Tools	0.5
Viewing and Raytracing, Intersection and Shading, Projections	1
2D and 3D Geometric Transformations, Scene Graphs	2
Pipeline and Rasterization, Triangle Meshes, Viewports, Clipping, Introduction to OpenGL	3
Imaging and Displays, Textures and Mapping, Sampling, Antialiasing, Compositing, Colors	3
Spline Curves and Surfaces, Geometric Modelling, Subdivision	2
Animation, Double-Buffering, Collision Detection	1.5
Advanced Raytracing, Acceleration, Illumination	1
Review and evaluation	2
Total:	16

10. Out-of-Class Assignments with Due Dates:

Assignment	Due Date (tentative)
Homework 1 – Perspective and Ray Tracing	Week #4
Homework 2 – Transformations and Scene Graphs	Week #6
Homework 3 – Meshes and Geometric Modeling	Week #8
Homework 4 – Textures and Illumination	Week #10
Homework 5 – Spline Curves and Surfaces	Week #12

11. Student Evaluation:

Assessment	Weight	Due Date (tentative)
Homework	15 %	cf. section 10
Quizzes	15 %	Bi-weekly
Programming Projects	20 %	Monthly
Midterm Exam	20 %	Week #9
Final Exam	30 %	Week #17

12. Contribution of Course to Program Outcomes

This course contributes to the accomplishment of the following CMP program outcomes:

CMP program outcome	**Emphasis in this course**
a) An ability to apply knowledge of computing and mathematics appropriate to the discipline	●
b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	◑
c) An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs	◑
d) An ability to function effectively on teams to accomplish a common goal	
e) An understanding of professional, ethical, legal, security and social issues and responsibilities	
f) An ability to communicate effectively with a range of audiences	
g) An ability to analyze the local and global impact of computing on individuals, organizations and society	○
h) Recognition of the need for and an ability to engage in continuing professional development	
i) An ability to use current techniques, skills, and tools necessary for computing practice	◑
j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices	●
k) An ability to apply design and development principles in the construction of software systems of varying complexity	◑

Emphasis: ● High; ◑ Medium; ○ Low; Blank – Nothing Specific Expected