

## Course Title: CS-861 Advanced Computer Graphics

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| <b>Credit Hours:</b>           | 3+0  |
| <b>Pre-requisites:</b>         | <ul style="list-style-type: none"><li>• Computer Graphics</li><li>• Data Structures</li></ul>  |
| <b>Course Description:</b>     | Computer Graphics has made a sound impact in the entertainment industry as well as various other scientific fields. In this course the concepts learnt in computer graphics will be discussed in further detail and advance topics will be introduced to the students. Assignments and projects will prepare students to take on large scale computer graphics projects.   |
| <b>Tools and Technologies:</b> | <i>OpenGL and GLSL</i>   |
| <b>Learning Outcomes:</b>      | On successful completion of this course students will be able to: <ol style="list-style-type: none"><li>1. Develop large scale computer graphics projects</li><li>2. Understand and work in various sub-fields of computer graphics</li><li>3. Use Shaders for developing applications</li></ol>   |
| <b>Tentative MS Thesis:</b>    | <ul style="list-style-type: none"><li>• Realistic Physical Simulation of Vehicle Impact</li><li>• Displaying Large Scale Progressive Meshes</li><li>• Extracting 3D objects from Images</li><li>• Light Field Rendering</li></ul>  |
| <b>Text Books:</b>             | No specific text book. Lecture Notes, Handouts and research papers   |
| <b>Reference Books:</b>        | <ul style="list-style-type: none"><li>• Peter Shirley et. al. (2005): Fundamentals of Computer Graphics. (A K Peters).</li><li>• Hearn and Baker (2003): Computer Graphics with OpenGL. (Prentice Hall).</li><li>• Randi J. Rost et. al. (2009): OpenGL Shading Language (Addison-Wesley Professional)</li><li>• Dave Shreiner (2009): OpenGL Programming Guide: The Official Guide to Learning OpenGL (Addison-Wesley Professional)</li><li>• T. Theoharis et. al. (2008): Graphics &amp; Visualization: Principles and Algorithms. (A K Peters)</li></ul>  |
| <b>Course Contents:</b>        | <ul style="list-style-type: none"><li>• Meshes<ul style="list-style-type: none"><li>▪ Mesh Simplification</li><li>▪ Progressive Meshes</li><li>▪ Streaming Meshes</li><li>▪ Mesh Smoothing</li><li>▪ Anti-Aliasing Techniques</li></ul></li><li>• Programmable Graphics Hardware</li><li>• Light and Illumination</li><li>• Color Modeling<ul style="list-style-type: none"><li>▪ Perception</li><li>▪ Tone Mapping</li></ul></li><li>• Texture Mapping</li><li>• Visible-Surface Detection and Hidden Surface Removal</li><li>• Visibility<ul style="list-style-type: none"><li>▪ Ray Tracing</li><li>▪ Radiosity</li><li>▪ Photon Mapping and Shadows</li></ul></li><li>• Parametric Curves and Surfaces</li><li>• Image Manipulation Techniques</li><li>• Frequency Analysis and Signal Processing</li><li>• Image-Based Rendering</li><li>• Animation and Rigid Body Dynamics</li><li>• Introduction to Game Engines</li><li>• Rendering Point based Models</li><li>• Rendering Volumetric and 4D datasets</li></ul> |