



COMPUTER GRAPHICS

PROF. SAMIT BHATTACHARYA

Department of Computer Science and Engineering
IIT Guwahati

PRE-REQUISITES : Knowledge of data structures and algorithm is preferable

INTENDED AUDIENCE : UG students of Computer Science and Engineering/IT

INDUSTRIES APPLICABLE TO : (1) Gaming and entertainment industry

- (2) Industry dealing with display technology
- (3) Interactive consumer electronic industry
- (4) Any other industry dealing with display and content rendering

COURSE OUTLINE :

Computer graphics is one of the fundamental aspects of any computing system. Its primary role is to render the digital content (0's and 1's) in a human-comprehensible form on the computer screen. The rendering follows a series of stages, collectively known as the graphics pipeline. In this course, we will introduce the pipeline and its stages. The topics covered include various object representation techniques followed by the pipeline stages of modeling transformation, 3D to 2D viewing transformation, clipping and hidden surface removal and scan conversion (rendering). We shall follow the stages of the 3D graphics pipeline. In order to complete the coverage, we shall also briefly introduce the present day graphics hardware (I/O devices, GPU) and the widely popular OpenGL graphics library

ABOUT INSTRUCTOR :

Prof. Samit Bhattacharya is an associate professor in the Department of Computer Science and Engineering, IIT Guwahati, with more than 12 years of teaching and research experience. He has taught numerous courses including those related to the proposed course, to both the PG and UG level students of Computer Science and Engineering. He also has nearly five dozen publications as books, book chapters, patents, peer-reviewed journals and conference proceedings under his credit. He has already graduated four PhD students (with another four at various stages of their research) and guided more than a dozen MTech projects and nearly three dozen BTech projects including those related to this area.

COURSE PLAN :

Week 1: Introduction - historical evolution, issues and challenges, graphics pipeline, hardware and software basics

Week 2: Object representation - boundary representation, splines, space partitioning

Week 3: Modeling transformations - matrix representation, homogeneous coordinate system, composition, 3D transformations

Week 4: Illumination and shading - background, simple lighting model, shading models, intensity representation, color models, texture synthesis

Week 5: 3D viewing - viewing pipeline, view coordinate system, viewing transformation, projection, window-viewport transformation

Week 6: Clipping and hidden surface removal - clipping in 2D. 3D clipping algorithms, hidden surface removal

Week 7: Rendering - scan conversion of line, circle, fill-area and characters, anti-aliasing

Week 8: Graphics hardware and software - generic architecture, I/O, GPU, Shader programming, graphics software (OpenGL)