



COMPUTER GRAPHICS

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IIT Guwahati

TYPE OF COURSE : New | Core | UG**COURSE DURATION** : 8 weeks (17 Aug' 20 - 9 Oct' 20)**EXAM DATE** : 17 Oct 2020**PRE-REQUISITES** : Knowledge of data structures and algorithm is preferable**INTENDED AUDIENCE** : UG students of Computer Science and Engineering/IT**INDUSTRIES APPLICABLE TO** : Not Applicable**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 Dept of Computer Science and Engineering, IIT Guwahati, with more than 10 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 four dozen publications as books, book chapters, patents, peer-reviewed journals and conference proceedings under his credit. He has already graduated two PhD students (with another eight at various stages of their research) and guided about a dozen MTech projects and more than two dozen BTech projects.

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)