

CS - 406 (Computer Graphics)

Second Semester

Course Description

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| Course Code Number | CS-406 | Course Title | Computer Graphics |
| Semester Hours | Total 4 hours per week Lecture 2 hours per week Lab 2 hours per week | No. of Credit Units | 3 |
| Prerequisite | None | Course Coordinator | Dr. Ah Nge Htwe Faculty of Computer Science |
| Course Length | 15 Weeks | Type of Instruction | Lecture + Lab |

Course Objective

The objective of this course is to provide the concept of computer graphics application, understand techniques and algorithms of 2D and 3D computer graphics including viewing, transformation, lighting, modeling, rendering and animation.

Course Contents:

- Overview of computer graphics system and applications
- Output primitives
- Attributes of output primitives
- 2D and 3D geometric transformations
- 3D viewing , object representation
- 3D visible surface identification and rendering
- Computer animation

Learning Outcomes

On successfully completion of this course, student will be able to:

- design and Implement the algorithms to draw the line and circle
- apply different geometrical transformations such as translation, scaling, rotation, reflection and shear in 2D and 3D
- understand 2D viewing and various clipping algorithms
- understand the object representation and visible identification methods in 3D
- design animation sequences
- gain skills to study the advanced concepts and techniques of computer graphics

Text Book

[1] Computer Graphics C Version, Second Edition, Donald Hearn and M. Pauline Baker, 1997.

Reference Books

[1] Computer Graphics with OpenGL (Int. Edition) by Donald Hearn, M. Pauline Baker and Warren Carithers, 2014.

[2] Interactive Computer Graphics (Sixth Edition) by Edward Angel and Dave Shreiner 2011 (e-book)

Course Organization

Student participation in this course will involve the following activities:

- Attending the lectures
- Lab
- Test
- Quiz/Moodle
- Assignments
- Tutorial
- Exam

Assessment Plan for the Course

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| Paper Exam | 50 % |
| Assignment | 10 % |
| Tutorial | 10 % |
| Quizzes/ Moodle | 10 % |
| Class Participation | 10 % |
| Lab Test / Project | 10 % |

Tentative Lecture Plan

Periods : 45 periods for 15 weeks (3 periods per week)

| No. | Topics | Week | Remark |
|-----|--|------------|--------------------|
| | Introduction to Computer Graphics | | Chapter (1) |
| 1. | Computer graphics applications | Week 1 | |
| | Overview of Graphics Systems | | Chapter (2) |
| 2. | Video display devices Raster-scan systems and random-scan systems Stereoscopic and Virtual-Reality Systems | Week 1+ 2 | |
| | Output Primitives | | Chapter (3) |
| 3. | Points and lines Line-drawing algorithms Loading the frame buffer | Week 3 + 4 | |

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B.C.Sc. (Fourth Year)

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|-----|--|------------|---------------------|
| | Circle-generating algorithms Pixel addressing and object geometry Filled-area primitives | | |
| | Attributes of Output Primitives | | Chapter (4) |
| 4. | Line attributes Color and gray scale levels Antialiasing | Week 5 | |
| | Two-Dimensional Geometric Transformations | | Chapter (5) |
| 5. | Basic transformations Matrix representations and homogeneous coordinates Composite transformations Other transformations | Week 6 + 7 | |
| | Two-Dimensional Viewing | | Chapter (6) |
| 6. | Viewing pipeline Viewing coordinate reference frame Window-to-viewport coordinate transformation Clipping operations Point and line clipping Polygon clipping | Week 8 + 9 | |
| | Three-Dimensional Concepts | | Chapter (9) |
| 7. | Parallel Projection Perspective Projection Surface Rendering | Week 9 | |
| | Three-Dimensional Object Representations | | Chapter(10) |
| 8. | Polygon surfaces Quadric surfaces | Week 10 | |
| | Three-Dimensional Geometric Transformation | | Chapter (11) |
| 9. | Geometric transformations Other transformations Composite transformations | Week 11 | |
| | Three-Dimensional Viewing | | Chapter (12) |
| 10. | Viewing pipeline Viewing coordinates Projections | Week 12 | |
| | Visible-surface detection methods | | Chapter (13) |
| 11. | Back-face detection Depth-buffer method A-buffer method Scan-line method Depth-sorting method BSP-tree method Area-subdivision method Ray-casting method Wireframe methods | Week 13 | |

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| | Illumination models and surface-rendering methods | | Chapter(14) |
| 12. | Light sources Basic illumination models Polygon-rendering methods Ray-tracing methods | Week 14 | |
| | Computer Animation | | Chapter(16) |
| 13. | Design of animation sequences Raster animations Key-frame systems - Morphing Motion specifications | Week 15 | |