	VIETNAM NATIONAL UNIVERSITY OF HO CHI MINH CITY UNIVERSITY OF NATURAL SCIENCES **FACULTY OF INFORMATION TECHNOLOGY**

COURSE SYLLABUS

Course Code: TH109

Title: Computer Graphics

Credits: 4

Workload:
Lecture hours: **3** periods * **15** weeks = **45** periods
Laboratory hours: **2** periods * **15** weeks = **30** periods
Preparative hours: **2** periods * **15** weeks = **30** periods

Prerequisite: TH012 - Intermediate Programming A2
TH105 - Data structure 2
Linear Algebra

Course Objectives:

This course introduces the basic concepts and algorithms of computer graphics and provides student with sufficient background to write computer graphics applications. Covered topics include the fundamentals of scan conversion of geometric primitives, 2D and 3D transformations, 3D viewing and perspectives, hidden surface removal, simple illumination models, coloring, and animation.

Main Text: N/A

References:

- *Computer Graphics*, Francis S. Hill, Jr. New York Macmillan Publishing Company, 1990.
- *Computer Graphics*, C version Donald Hearn, M. Pauline Baker. Upper Saddle River, New Jersey: Prentice Hall International Inc, 1997.
- *Computer Graphics - Principle and Practice*, James D. Foley, Andries Van Dam, Feiner, John Hughes - New York: Addison - Wesley, 1996.
- *Introduction to Computer Graphics*, James D. Foley, Andries Van Dam, Feiner, John Hughes. New York: Addison - Wesley, 8-1995.

Course Outline:

Chapter 1 Introduction to Computer Graphics

1.1 Introduction to Computer Graphics
- 1.1.1 Concepts
- 1.1.2 Some Applications of Computer Graphics

1.2 Overview of a Graphic System
- 1.2.1 Hardware Components
- 1.2.2 Software Tools

1.3 Methods to approach this course
- 1.3.1 Objectives of the course
- 1.3.2 Supporting Tools

Chapter 2 Computer Graphics Primitives

- 2.1 Introduction to Computer Graphics Primitives
  - 2.1.1 Computer Graphics Primitives: points, lines, regions, texts…
  - 2.1.2 Properties of Computer Graphics Primitives
- 2.2 Curve Drawing Algorithms
  - 2.2.1 Drawing Lines
  - 2.2.2 Drawing Circles and Ellipses
  - 2.2.3 Drawing Conics and Other Curves
- 2.3 Filling Algorithms
  - 2.3.1 Boundary Fill Algorithm
  - 2.3.2 Scanline Algorithm
- 2.4 Other Supporting Algorithms
  - 2.4.1 Some Polygon Algorithms (Internal, External Point, Area, …)
  - 2.4.2 Other Algorithms

Chapter 3 Two-Dimensional Transformations

- 3.1 Basic transformations:
  - 3.1.1 Introduction to Transformations, Matrix Representation of Transformations, and Affine Transformations.
  - 3.1.2 Translation
  - 3.1.3 Scaling
  - 3.1.4 Rotation
  - 3.1.5 Matrix Representation of Transformations. Homogeneous Coordinates
- 3.2 Composing Transformations
  - 3.2.1 Composite Two or More Transformations (Translation, Rotation, Scaling)
  - 3.2.2 Scaling About an Arbitrary Point
  - 3.2.3 Rotating About an Arbitrary Point
- 3.3 The Affine Transformations
- 3.4 Other Transformations
  - 3.4.1 Shearing
  - 3.4.2 Reflection
  - 3.4.3 Non-Affine Transformations
- 3.5 Coordinate Transformations

Chapter 4 2-Dimensional Visualization

- 4.1 2D Object Visualization Process
  - 4.1.1 Coordinate Systems and Coordinate Transformations
  - 4.1.2 Mapping from a Window to a Viewport
- 4.2 Line Clipping Algorithms
  - 4.2.1 The Cohen-Sutherland Algorithm
  - 4.2.2 The Liang-Barsky Algorithm
- 4.3 Polygon Clipping Algorithms
  - 4.3.1 The Sutherland-Hodgeman Algorithm
  - 4.3.2 The Weiler-Antherton Algorithm

Chapter 5 Introduction of 3-Dimensional Graphics

- 5.1 Overview of 3D Graphics
  - 5.1.1 Three-Dimensional Display Methods
  - 5.1.2 Supporting Tools
- 5.2 Three-Dimensional Object Representations
  - 5.2.1 Polygon Surfaces
  - 5.2.2 Quadric Surfaces
  - 5.2.3 Bezier Curves and Surfaces, B-Splines
- 5.3 Three-Dimensional Geometric Transformations
  - 5.3.1 Translation
  - 5.3.2 Rotating About a Coordinate Axis
  - 5.3.3 Scaling
  - 5.3.4 Composing Transformations
  - 5.3.5 Coordinate Transformations

Chapter 6 Viewing Transformations

- 6.1 Visualization Process
- 6.2 Projections
  - 6.2.1 Perspective Projections
  - 6.2.2 Parallel Projections
- 6.3 Three-Dimensional Clipping Algorithm

Chapter 7 Hidden Surface Elimination

- 7.1 Depth Buffer Method
- 7.2 Scan-Line Method
- 7.3 BSP Method

Chapter 8 Illumination Models and Shading Methods

- 8.1 Basic Illumination Models
- 8.2 Shading Methods
  - 8.2.1 Gouraud Shading Method
  - 8.2.2 Phong Shading Method

Chapter 9 Miscellaneous

- 9.1 Colors
- 9.2 Animation
- 9.3 Some new computer graphics issues

Grading Final exam : 70%

Assignments: 30%