

## **COURSE SYLLABUS**

### **CS411- Computer Graphic**

#### **1. GENERAL INFORMATION**

Course name: Computer Graphic

Course name (in Vietnamese): Đồ họa máy tính

Course ID: CS412

Knowledge block:

Number of credits: 4

Credit hours for theory: 40

Credit hours for practice: 30

Credit hours for self-study: 90

Prerequisite: None.

Prior-course: None.

Instructors: Tran Thai Son, Ph.D

#### **2. COURSE DESCRIPTION**

This class will introduce about concepts, structures, and programming techniques for display of 2D and 3D objects. It will include drawing algorithms (line, circle), rasterization (triangle and polygon), 2D geometrical transformation, 3D geometrical transformations, 3D projections (orthographic and perspective), surface shading, 2D and 3D clipping, and ray tracing. OpenGL will be the main toolbox for experiments.

#### **3. COURSE GOALS**

At the end of the course, students are able to

ID	Description	Program LOs
G1	Understand knowledge about 2D coordinate, pixel and basic solutions for line drawing, circle drawing, clipping, 2D transformation and color filling	LO1
G2	Describe and understand about fundamental knowledge of linear algebra, geometry for computer graphic	LO1
G3	Describe and understand about 3D object viewing in terms of wireframe, hidden line/hidden surface removal, illumination models, 3D transformation, and shading methods	LO1
G4	Describe and understand color system in computer graphic	LO2
G5	Practice and enhance computer programming using OpenGL toolkit	LO2, LO3
G6	Attend classes to read, discuss and explain research papers or technical report.	LO10, LO12

#### 4. COURSE OUTCOMES

CO	Description	I/T/U
G1	Know mathematic for computer graphic	I/T
G2.1	Understand 2D coordinate system, discrete space and pixel	I/T
G2.2	Understand and explain solutions for line drawing, circle drawing, clipping, 2D transformation and color filling	I/T
G3.1	Understand and explain 3D viewing space and perspective projection	I/T
G3.2	Understand and explain 3D point cloud, wireframe and 3D surface visualization	I/T
G3.3	Understand and explain curve surface, hidden line/hidden surface removal, illumination models, 3D transformation, and shading methods	I/T

G4	Understand and apply color system in CV	I/T
G5.1	Know and implement how to use OpenGL for implementing computer program.	T/U
G5.2	Know and implement the process of Computer graphic to generate image of 2D shape or 3D object.	T/U
G6	Attend classes to read and understand computer graphic methods through published papers in conference or journal of computer graphic	U

## 5. TEACHING PLAN

### Lecture:

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)
1	Math review and introduction of computer graphic	G1, G2.1	Deliver a lecture / Brainstorm / Discuss
2	Line drawing and circle drawing in discrete space	G2.2, G5.1	Deliver a lecture / Brainstorm / Discuss
3	Clipping algorithms	G2.2, G5.1	Deliver a lecture / Brainstorm / Discuss
4	2D transformation and its applications	G2.2, G5.1	Deliver a lecture / Brainstorm / Discuss
5	Color system and algorithms of filling color	G2.1, G4	Deliver a lecture / Brainstorm / Discuss

6	3D viewing, perspective and parallel projection	G3.1, G3.2	Deliver a lecture / Brainstorm / Discuss
7	3D transformation and its applications	G3.3, G5.1, G6	Deliver a lecture / Brainstorm / Discuss
8	Curve and curve surface	G3.3, G5.1, G6	Deliver a lecture / Brainstorm / Discuss
9	Hidden line / hidden surface removal	G3.3, G5.1, G6	Deliver a lecture / Brainstorm / Discuss
10	Illumination models and shading	G3.3, G5.2, G6	Deliver a lecture / Brainstorm / Discuss

For the practical laboratory work, there are 10 weeks which cover similar topics as it goes in the theory class. Each week, teaching assistants will explain and demonstrate key ideas on the corresponding topic and ask students to do their lab exercises either on computer in the lab or at home. All the lab work submitted will be graded. There would be a final exam for lab work.

### Lab:

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)
1	OpenGL: installation and its programming	G5.1, G5.2, G4	Deliver a lecture / Brainstorm / Discuss
2	Line drawing and circle drawing in discrete space	G2.2, G5.1	Brainstorm / Discuss
3	Clipping algorithms	G2.2, G5.1	Brainstorm / Discuss
4	2D transformation and its applications	G2.2, G5.1	Brainstorm / Discuss

5	Project's introduction	G3.1, G3.2, G3.3, G4, G6	Deliver a lecture / Brainstorm / Discuss
6	Project's hints	G5.1, G5.2, G4, G6	Brainstorm / Discuss
7	3D transformation and its applications	G3.3, G5.1, G6	Brainstorm / Discuss
8	Curve and curve surface	G3.3, G5.1, G6	Brainstorm / Discuss
9	Hidden line / hidden surface removal	G3.3, G5.1, G6	Brainstorm / Discuss
10	Illumination models and shading	G3.3, G5.2, G6	Brainstorm / Discuss

## 6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
<b>A1</b>	<b>Assignments /Attendant</b>	Implement algorithms of fundamental methods for each problem in computer graphic.	G2.1, G2.2	<b>5-20%</b>
<b>A2</b>	<b>Projects</b>	Utilize OpenGL toolkit and develop own idea to solve problems of computer graphic such that students can understand their proposed idea thoroughly. Students will compare their project results and the results of the other method.	G2.2, G3.2, G3.3, G4, G5.1, G5.2, G6	<b>40-50%</b>
<b>A3</b>	<b>Final Exams</b>	Essay and Quiz	G1, G2.1, G2.2, G3.1,	<b>40-50%</b>

			G3.2, G3.3, G4, G5.1, G5.2	
<b>A4</b>	<b>Attendant and activity in classes</b>	Attend and discuss in classes	G6	<b>5-10%</b>

## 7. RESOURCES

### Textbooks

- *Computer Graphics with Open GL (4th Edition)*, Donald D. Hearn, M. Pauline Baker, Warren Carithers. Pearson.
- *Computer Graphics Principles and Practice, Second Edition*, Foley, van Dam, Feiner, and Hughes. Addison-Wesley.

### Others

- Published papers in international conference and journal of computer graphic.

## 8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than 3 theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss on the topics of projects. However, individual work must be done and submitted on your own.