الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

Computer Graphics

Course Definition

Information

Technology

Engineering

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Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Artificial Intelligence
Course Code	BCG601
Number of Presentational Sessions*	18
Number of Synchronous Sessions**	18
Number of Shorter Tests***	2
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	48
Practical Sessions Work Load (hrs.)	48
Credit Hours	5

***Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).**

****Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).**

*****Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.**

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions (. This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

2. Prerequisites courses:

Course	Code
Computer Graphics	BCG601

3. Course Objectives:

The main aims of this course "Computer Graphics" are:

- This course provides basic principles and techniques to computer graphics algorithms.
- Students will gain experience in interactive computer graphics using the OpenGL API.
- This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience using a graphics application programming interface (OpenGL) by working on several programming algorithms and applications.

4. Learning Outcomes (LO):

By the end of this course, the learner is expected to acquire and learn the following subjects:

- Critical understanding of the theory of 2D and 3D transformations, projection and viewing
- Detailed knowledge of the graphics pipeline
- Detailed knowledge of shading and texture mapping algorithms
- Broad knowledge of 3D modeling and rendering techniques
- Ability to understand, design and implement scene graphs
- Practical skills in graphics programming including scene graph programming and I/O processing
- Ability to think and plan critically in three dimensions

5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports****
CH1	A Survey of Computer Graphics	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH2	Graphics Systems	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH3	BASIC RASTER GRAPHICS ALGORITHMS FOR DRAWING 2D PRIMITIVES	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√

CH4	GEOMETRIC TRANSFOR MATIONS	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH5	TREE– DIMENSION AL VIEWING	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH6	THREE– DIMENSION AL OBJECT REPRESENT ATIONS	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH7	Colors	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√

***The final exam is two hours long and is given at the end of the course.**

****Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.**

*****Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.**

6. Course Syllabus:

Chapter	Subject	Content	Number of Learning Objects	Number of synchronous Learning Objects
CH1	A Survey of Computer Graphics	1. Graphs and Charts 2. Graphical User Interface (GUI) 3. Computer-Aided Design 4. Virtual-Reality Environments 5. Data Visualization 6. Education and Training 7. Art and Advertisement 8. Image Processing 9. Entertainment	9	5
CH2	Graphics Systems	1. Cathode Ray Tubes 2. Display graphics system 3. Graphics Software 4. OpenGL 5. Examples	4	2
CH3	BASIC RASTER GRAPHICS ALGORITHMS FOR	1. Screen coordinates 2. LINE-DRAWING ALGORITHMS 3. Line attributes using OpenGL 4. Circle-Generating Algorithms	9	5

	DRAWING 2D PRIMITIVES	5. Fill-Area Primitives 6. Character Primitives 7. Antialiasing 8. CLIPPING ALGORITHMS 9. Display List		
CH4	GEOMETRIC TRANSFORMATIONS	1. Basic Two-Dimensional Geometric Transformations Heuristics 2. Matrix Representation and Homogeneous Coordinates 3. Two Dimensional Composite Transformations 4. Other Two-Dimensional Transformation 5. Transformation Between Two-Dimensional Coordinate Systems 6. Basic Three-Dimensional Geometric Transformations 7. Other Three-Dimensional Transformation 8. Transformation Between Two-Dimensional Coordinate Systems 9. Geometric Transformations in OpenGL	**9**	**5**
CH5	TREE-DIMENSIONAL VIEWING	1. Three-Dimensional Viewing-Coordinate Parameters 2. Viewing Transformation 3. Projection Transformation	**6**	**3**

		4. Three-Dimensional clipping algorithms 5. viewport transformation 6. 3D Viewing Transformation functions in OpenGL		
CH6	THREE-DIMENSIONAL OBJECT REPRESENTATIONS	1. Polyhedral 2. curved Surfaces 3. Spline Representations 4. Cubic-spline Interpolation 5. Bezier Spline Curves 6. Bezier Surfaces 7. B-Spline Curves 8. B-SPLINE Curves' equations 9. B-Spline Curves in Open GL 10. Sweep representations 11. Constructive solid geometry methods 12. Octrees 13. BSP trees 14. Fractal-Geometry	**14**	**7**
CH7	Colors	1. Colors distinction 2. Colors in computers 3. RGBA and Color index	**3**	**2**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description
C++, OpenGL	C++ Programing language, OpenGL (Graphics Library)

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH2	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☑ Experiment ☐ Other	
CH3	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☑ Experiment	

	☐ Other	
CH4	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☑ Experiment ☐ Other	
CH5	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☑ Experiment ☐ Other	
CH6	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☑ Experiment ☐ Other	
CH7	☑ Exercises ☑ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	

8. References:

Books

1. *Computer Graphics with OpenGL, third edition.* Donald Hearn and M. Pauline Baker. Prentice Hall, 2003. ISBN: 0130153907.
2. *Computer Graphics: Principles and Practice. Second edition in C.* J.D. Foley, A. van Dam, S.K. Feiner et J.F. Hughes. Addison-Wesley, 1996, ISBN 0-201-84840-6.
3. *OpenGL Programming Guide,* M. Woo et al., 4th Edition. Addison-Wesley, 1999.
4. *OpenGL Reference Manual*, Third Edition, Addison-Wesley, 2000.

Useful Links

1. The OpenGL Homepage (Documentation, specifications, and downloads)
2. OpenGL Blue Book (old version)
3. Sample Code from the Redbook, 4th Edition
4. Nate Robins' Win32 GLUT Page (Binaries and source, which should compile for non-Windows platforms too)
5. Source code (OpenGL Version 1.4) from OpenGL red book (4th edition) should be available here: zip , tar.Z , tgz .