



## Course Specifications

<b>Course Title:</b>	Interactive Computer Graphics
<b>Course Code:</b>	CSI 514
<b>Program:</b>	B.Sc.
<b>Department:</b>	Computer Science and Information
<b>College:</b>	College of Science AL Zulfi
<b>Institution:</b>	Al Majmaah University

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## A. Course Identification

<b>1. Credit hours:</b>			
<b>2. Course type</b>			
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input type="checkbox"/>
b.	Required <input type="checkbox"/>	Elective <input checked="" type="checkbox"/>	Others <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 10 <sup>th</sup> /			
<b>4. Pre-requisites for this course (if any):</b> None			
<b>5. Co-requisites for this course (if any):</b> None			

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	48	80 %
2	Blended	6	10 %
3	E-learning	6	10 %
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	10
4	Others (specify)	
	<b>Total</b>	60

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course is to introduce students to provide an introduction to basic concepts and methodologies for digital image processing in both theoretical and practical aspects. Therefore the course topics are selected to provide a good understanding and design principles for several effective techniques used for image enhancement and to provide the necessary knowledge for further study in Computer Vision, Scientific Visualization and Image Pattern Recognition. These topics are: Introduction: Image Models, Image Acquisitions and digitization, Terminologies - Image Transformations: Manipulation & Processing by (Fourier, Discrete Cosine, Heling, Wavelet transforms) - Image Enhancement: Spatial & Frequency Domain Filters methods - Image Compression methods and Restoration - Image Segmentation



## 2. Course Main Objective

- Learn basic and fundamental interactive computer graphics techniques;
- Be competent with graphics programming using an API (OpenGL).
- Be familiar with state-of-the-art graphics hardware and display technology.
- Be familiar with 2D and 3D graphics algorithms.
- Learn 3D image synthesis techniques.
- Enable students to be efficient in their work.

## 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Acquire knowledge of computing and mathematics appropriate to interactive computer graphics including simulation and modeling, and Understand of best practices and standards and their application related to interactive computer graphics.	K1
2	<b>Skills :</b>	
2.1	Apply mathematics, physics, and theories and models of human perception to computer graphics applications and problem solving.	S1
2.2	Use appropriate APIs to exploit the graphics pipeline architecture to produce interactive programs modeling and rendering dynamic environments, interactions of light and object surfaces, shadows and reflections.	S2
3	<b>Values:</b>	
3.1	Use current techniques, skills, and tools necessary for interactive computer graphics practice.	C1

## C. Course Content

No	List of Topics	Contact Hours
1	1. Introduction: An introduction to basic concepts and methodologies for digital image processing in both theoretical and practical aspects - Image Models, Image Acquisitions and digitization, Terminologies.	8
2	2. Basics: Basic analytical geometry (e.g. points, lines, segments, planes, triangles, intersections) - Camera models, projection, navigation - Introduction to OpenGL.	8
3	3. Image Transformations and Enhancement: Manipulation & Processing by (Fourier, Discrete Cosine, Hotelling, Wavelet transforms) - 3D primitives and transformation- Spatial and Frequency Domain Filters methods - Hierarchical transformation - Lighting and shading – Practical applications using OpenGL	8
4	4. Image Compression and Segmentation: Image Compression methods and Restoration - geometric modeling in OpenGL - programmable shaders. - Image Segmentation – Animation - Practical applications using OpenGL.	12
5	5. Advanced Rendering Techniques: Ray tracing - Geometric modeling - Image-based rendering - Practical applications using OpenGL	8



6	Advanced Rendering Techniques (Cont.): Automated scene modeling (e.g. stereo, structured light, laser range finding) - Computational photography - Camera model design - Practical applications using OpenGL.	12
<b>Total</b>		60

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	Acquire knowledge of computing and mathematics appropriate to interactive computer graphics including simulation and modeling, and Understand of best practices and standards and their application related to interactive computer graphics.	Lectures, Individual presentations & Brainstorming exercises	Quiz , Mid Exam , Assignment, Final Exam, Individual demonstrations.
<b>2.0</b>	<b>Skills</b>		
2.1	Apply mathematics, physics, and theories and models of human perception to computer graphics applications and problem solving.	Lectures, Individual presentations & Brainstorming exercises	Quiz , Mid Exam , Assignment, Final Exam, Individual demonstrations.
2.2	Use appropriate APIs to exploit the graphics pipeline architecture to produce interactive programs modeling and rendering dynamic environments, interactions of light and object surfaces, shadows and reflections.	Lectures, Individual presentations & Brainstorming exercises	Quiz , Mid Exam , Assignment, Final Exam, Individual demonstrations.
<b>3.0</b>	<b>Values</b>		
3.1	Use current techniques, skills, and tools necessary for interactive computer graphics practice.	Lectures, Individual presentations & Brainstorming exercises	Quiz , Mid Exam , Assignment, Final Exam, Individual demonstrations.
...			

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes		10 %
2	Mid Exams		30 %
3	Assignments		10 %
4	Group Discussion, Presentation		10 %
5	Final Exam		40 %

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

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## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>• Rafael Gonzalez, “Digital Image Processing”, Prentice Hall, 2008.</li> </ul>
<b>Essential References Materials</b>	<ul style="list-style-type: none"> <li>• Maria Petrou, " Image Processing: The Fundamentals", John Wiley and Sons, 2010</li> </ul>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li>• Wilhelm Burger, Mark Burge, “Principles of digital image processing: Fundamental Techniques”, Springer, 2009.</li> </ul>
<b>Other Learning Materials</b>	Videos and presentations are available with instructor

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms and Labs as those that are available at college of science Az Zulfi
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Smart Board and required software
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	
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Reference No.	
Date	