Al-Balqa' Applied University

Prince Abdullah Bin Ghazi Faculty of IT

Department of Computer Science

The Curriculum for the B.Sc. Degree in

Computer Graphics & Animation

March. 2017

Al-Balqa Applied University

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The curriculum for the B.Sc. degree in Computer Graphics & Animation (CGA) consists of (132) credit hours distributed as follows:

Table 1: Credit Hours distributed as follows

Requirements	Credit Hours	Total
University Requirements • Compulsory • Elective	21 6	27
Faculty Requirements	20	20
Specialization Requirements • Compulsory • Elective • Supportive	67 12 9	85
Total		132

University Requirements (27 credit hours) distributed as follows:

a) University Compulsory requirements (21 Credit hours)

Pre-requisite	Weekly Hours		Credit Hours	Course Name	Course Number
	Practical	Theory			
--	3	2	3	Computer Skills (1)	35005101
35005101	3	0	0	Computer Skills Lab (1)	35005100
301501199	-	3	3	Arabic Language (1)	35003101
35003102	-	3	3	Arabic Language (2)	35003102
301502099	-	3	3	English language (1)	35004101
35004101	-	3	3	English language (2)	35004102
--	-	3	3	Military Science	35001101
--	-	3	3	Patriotic Education	35002100
	6	**20**	**21**	**Total**	

b) University Elective requirements (6 Credit hours)

Credit Hours	Course Name	Course Number
3	Communication Skills	36001101
3	Educational Psychology	36002102
3	Jordanian Society	36003103
3	Sport for all	36004104
3	Islamic Culture	36005105
3	Administration and Economic concepts	36006106
3	Agriculture in Jordan	36007107
3	Environment and Society	36008108
3	Righteous Caliphs History	36012109

Faculty Requirements (20 Credit Hours)

Pre-requisite	Weekly Hours		Credit hours	Course Name	Course Number
	Practical	Theory			
35005101*	0	3	3	Introduction to Computer Programming**	30801100
35005101, 30801100	3	2	3	Computer Skills (2) for Science Colleges	30801101
30801101*	3	0	0	Computer Skills (2) Lab for Science Colleges	30801102
30801101	0	3	3	Object Oriented Programming	30801203
30801203*	3	0	1	Object Oriented Programming Lab	30801204
30801203	0	3	3	Java Programming	30801205
30801205*	3	0	1	Java Programming Lab	30801206
--	0	3	3	Calculus (1)	30202101
30202101	0	3	3	Calculus (2)	30202102
	12	17	20	**Total**	

*: corequisite **: first semester enrollment

Specialization Requirements (85 credit Hours) distributed as follows:

a) Specialization Compulsory Requirements (67 hours)

Pre-requisite	Weekly Hours		Credit Hours	Course Name	Course Number
	Practical	Theory			
30801214	0	3	3	Algorithms Design and Analysis	30801215
30801214	0	3	3	Databases Design and Management (1)	30801243
30801243*	3	0	1	Databases Design and Management Lab	30801244
30202101	0	3	3	Mathematics for Computer Graphics	30807121
--	3	2	3	Principles of Fine Arts	30807141
،30801101	0	3	3	Principles of Computer Graphics	30807222
30807222	0	3	3	Rendering Techniques	30807223
30807222	0	3	3	2D Animation	30807231
30807231*	3	0	1	2D Animation Lab	30807232
30807141	0	3	3	Computer Application for Arts	30807242
30801205	0	3	3	Visual Programming for Computer	30807311
30801243	0	3	3	Internet Applications Programming	30801207
*30801207	3	0	1	Internet Applications Programming Lab	30801208
30807223	0	3	3	Interactive Graphics	30807324
30807231	0	3	3	Storyboard Creation	30807333
30807231	0	3	3	3D Modeling	30807334
30807231	0	3	3	3D Character Design	30807335
30807223	0	3	3	Multimedia	30801348
30807335	0	3	3	3D Character Animation	30807436

30801205	0	3	3	Human Computer Interaction	30807444
30807231	0	3	3	Digital Films Design	30807445
30807445*	3	0	1	Digital Films Design Lab	30807446
Cr.Hrs 90	-	-	1	Graduation Project (1)	30807471
30807471	-	-	2	Graduation Project (2)	30807472
Cr.Hrs 90	-	-	6	Field Training for Computer Science	30807473
65				**Total**	

*: corequisite

a) Specialization Elective Requirements (12 hours)

Pre-requisite	Weekly Hours		Credit Hours	Course Name	Course Number
	Practical	Theory			
30807222	0	3	3	Parallel Computation for Computer Graphics	30807318
30801281	0	3	3	Advanced Computer Graphics	30807325
30801281	0	3	3	Image Processing & Computer Vision	30801455
30801205	0	3	3	Game Programming	30807351
30807311	0	3	3	Game Design	30807452
30807311	0	3	3	Games & Artificial Intelligence	30807453
Cr.Hrs 90	0	3	3	Special Topics in Computer Graphics+	30807463

*: corequisite +: Department approval

Supportive Specialization Courses (9 credit Hours)

Pre-requisite	Weekly Hours		Credit Hours	Course Name	Course Numbers
	Practical	Theory			
30202101	0	3	3	Discrete Structures and Mathematics	30801214
30202102	0	3	3	Principles of Numerical Analysis	30801281
	0	**6**	**6**	**Total**	

Course Description

Course Name	**:**	**Computer Skills (1)**	**Course Number**	**:**	**35005101**
Credit Hours	**:**	**[3] Th. : [2] Pra. : [3]**	**Prerequisites**	**:**	**----------**
Components of computers, basic concepts of information technology (IT), the use of personal computers and common computer applications at adequate level of competence, hardware and software of computers, commonly used software general applications (operating systems, word processing, spreadsheets, presentation and database software), brief introduction to communication (Internet, e-mail, world-wide-web, etc.).					

Course Name	**:**	Computer Skills(2) for Science Colleges	**Course Number**	**:**	**30801101**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801100, 35005101**
Basics of programming, algorithm development using top-down design with syntax and semantics of the C++ programming language, creating, compiling and executing C++ programs, primitive data types, operations, Loops, control structures, procedures and functions, arrays and classes.					

Course Name	**:**	**Object Oriented Programming**	**Course Number**	**:**	**30801203**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801101**
Object-oriented (OO) programming environment, OO building blocks, input/output, loops, decisions, functions, arrays and strings, data structures, encapsulation, advanced variables, object oriented programming, useful OO features, classes and objects, inheritance, composition, polymorphism, method overloading, handling exceptions, thread programming and multithreading.					

Course Name	**:**	**Object Oriented Programming Lab**	**Course Number**	**:**	**30801204**
Credit Hours	**:**	**[1] Th. : [0] Pra. : [3]**	**Prerequisites**	**:**	***30801203**
Structured Programming Skills Recap, Object-Oriented Programming(OOP) Skills, Classes And Objects ,Access Modifiers, Constructors, Constructor Overloading, Destructors, Using Constant in OOP, Using Static in OOP, Methods and Parameter Passing , Array of Objects, Composition, Inheritance , Abstract Classes, Derived Classes, Interfaces, Method Override ,Polymorphism, Working with Files, Exception Handling, OOP and GUI.					

Course Name	:	**Java Programming**	**Course Number**	:	**30801205**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801203**

Introduction to Java, the Java programming environment, variables, primitive data types, expressions, control constructs, strings in Java, arrays and vectors, Hash tables, files and I/O in Java, loops, Java GUI, components, events, layout managers, improved GUI libraries, threads, synchronization, Sockets, writing a server and a client.

Course Name	:	**Java Programming Lab**	**Course Number**	:	**30801206**
Credit Hours	:	**[1] Th. : [0] Pra. : [3]**	**Prerequisites**	:	***30801205**

Introduction to Java, JDK and IDE Installation, Input and Output Statements, Construct Basic Java Program with Class, Control Structures, Methods and Objects, Constructors, Arrays and Array List, Inheritance, Polymorphism, Abstract Classes and Interfaces, Exception Handling, Strings, File Processing, GUI Basics and Layout, Event Driven Programming.

Course Name	:	**Rendering Techniques**	**Course Number**	:	**30807223**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30807222**

Techniques used in transforming, modeling and producing 2D graphics and changing them to 3D. Presenting curved and polygonal graphs in 3D model. lighting and its space. The private and public lighting systems. Rays, breaking and shades. Computational rays, framing shapes, twisting shapes, processes and algorithms of weaving images and their shades. Parallel presentation.

Course Name	:	**Mathematics for Computer Graphics**	**Course Number**	:	**30807121**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30202101**

Mathematical techniques required to resolve geometric problems and design computer programs for computer graphic applications including numbers, algebra, trigonometry, coordinate geometry, transforms and Vectors. Advanced areas of matrix transforms, 3D curves and surface patches. Problem-solving techniques using vector analysis and geometric algebra are also discussed.

Course Name	**:**	**Principles of Fine Arts**					**Course Number**	**:**	**30807141**
Credit Hours	**:**	**[3]**	**Th. :**	**[2]**	**Pra. :**	**[3]**	**Prerequisites**	**:**	-
Introduces the basic concepts of fine art. Design various elements of arts. Visual awareness through hands-on projects.									

Course Name	**:**	**2D Animation**					**Course Number**	**:**	**30807231**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**	**Prerequisites**	**:**	**30807222**
Skill development in the use of software to develop two-dimensional animation including creating, importing, and sequencing media elements to create multimedia presentation. Emphasis on conceptualization, creativity, and visual aesthetics.									

Course Name	**:**	**2D Animation Lab**					**Course Number**	**:**	**30807232**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**	**Prerequisites**	**:**	**30807231***
Practices on basic animation principles to produce a sequence. Emphasis will be placed on timing and performance. Use of capture device, pencil tests, inking, and other 2D animation skill will be explored.									

Course Name	**:**	**Storyboard Creation**					**Course Number**	**:**	**30807333**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**	**Prerequisites**	**:**	**30807231**

Arranging the story and wording it, applying illustrating sequential graphics for conveying a story. Principles of storyboard, basics of cinema directing and the visual expression. Advanced skills for the story board and the art of telling a story including cutting pauses, the rule of 180 degree, drawing the attention of the audience, accidental shots, framing the components. The course takes care of technical of drawings and designing the characters, such as, training on drawing, positioning lines, the perspective and forming the scenes and light, generating the voice effects, adding the real image in the drawing and animating it.

Course Name	**:**	**3D Character Design**					**Course Number**	**:**	**30807335**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**	**Prerequisites**	**:**	**30807231**

The needed skills and main methods to produce animated cartoon films and designing characters using 3D Maya, drawing characters within a fixed frame in accordance with certain conditions, using different materials that is applicable for different domains that shows the real life moves coated with some architectural details.

Course Name	**:**	**3D Character Animation**					**Course Number**	**:**	**30807436**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**	**Prerequisites**	**:**	**30807335**

Various application for drawing shapes and the two main kind of animation motion Tween , shapetween. Designing and animating the face of the character and the applications of shape tween to move the mouth and eye. The application of different moves related to mouth and eye. Animating the body of character and applying the move on the joints and the other parts of the body like hands and legs and all other body parts. Use 3d Maya for establishing scenes, scenarios, the art of writing and controlling the scenes and how they work.

Course Name	**:**	**Interactive 3D Graphics**						**Course Number**	**:**	**30807324**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**		**Prerequisites**	**:**	**30807223**

Introducing the advanced principles and methods in the topic of animation and interactive graphics. methods of response and moving by the use of the special programming languages for 2D and 3D graphics. the problem of the visual designing and structuring of the information through displaying the multi interacting means

Course Name	**:**	**Multimedia**						**Course Number**	**:**	**30801348**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**		**Prerequisites**	**:**	**30807223**

Current multimedia and web presentation technologies and techniques. Using skills with graphics, images, animation, and video techniques, students create dynamic marketing and promotional materials and services.

Course Name	**:**	**Digital Film Design**						**Course Number**	**:**	**30807445**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**		**Prerequisites**	**:**	**30807231**

Explore the principles, theory, and mechanics of digital film and video editing using Macintosh computers. Emphasis will be on digital editing techniques, effects, audio, graphics, and titling. The class is designed for those interested in entering the field of digital editing, graphic artists interested in expanding their knowledge base of the industry, and independent producers in the Broadcast, Educational, Corporate, and Consumer markets.

Course Name	**:**	**Digital Films Design Lab**						**Course Number**	**:**	**30807446**
Credit Hours	**:**	**[3]**	**Th. :**	**[3]**	**Pra. :**	**[0]**		**Prerequisites**	**:**	**30807445***

Practices on editing techniques, effects, audio, graphics, and titling using computer software.

Course Name	:	**Human Computer Interaction**	**Course Number**	:	**30807444**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801205**

Introduction to the fundamentals of human-computer interaction, user interface design, and usability analysis. Students will learn principles and guidelines for usability, quantitative and qualitative analysis methods, and apply them through critiques of existing interfaces and development of new ones. Topics covered will also include cognitive models, task analysis, psychology, experimental design, and prototyping methods.

Course Name	:	**3D Modeling**	**Course Number**	:	**30807334**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801205**

Ways of drawing and embodying the elements of the scenes and then adding the materials and the lighting by the use of 3D graphics program such as 3D Studio Max, that is specialized in producing the 3D scenes for both fixed and animated ones. In addition to representing curves and surfaces, geometric simulation, mathematics and algorithms. the curves and surfaces of Bezier and B-spline , the solid architectural structure and other advanced modeling technologies.

Course Name	:	**Algorithms Design and Analysis**	**Course Number**	:	**30801215**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801210**

Introduction to algorithms, algorithm definition, algorithm representation، algorithm analysis, program performance, introduction to complexity analysis, asymptotic notations، divide and conquer algorithms , merge sort, quick sort, binary search, strassen matrix multiplications، writing recurrences, solving recurrences , master theorem, recursion tree, iterative method , graph algorithms, graph terminologies, graph representations, graph traversal algorithms; topological sort algorithms, minimum spanning tree, prim's and kruskal's algorithms.

Course Name	:	**Internet Applications Programming**	**Course Number**	:	**30801207**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801243**

Web design using HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets), HTTP protocol planning and designing effective web pages; implementing web pages by writing HTML and CSS code; enhancing web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia; and producing a functional, multi-page website, Client Server Architecture, Exploring HTML5, Introduction to server

side language, Front-end Frameworks, Model View Controller Design Methodology, JQuery, Ajax and JSON, Deploying a web application, building Web Database System, Practical Aspects of Web Security, Search Engine theories

Course Name	:	**Internet Applications Programming lab**	**Course Number**	:	**30801208**
Credit Hours	:	**[1] Th. : [0] Pra. : [3]**	**Prerequisites**	:	**30801207***

XHTML, Web server and Database Server, HTML5, CSS3, layout development, JavaScript, JQuery, Ajax, Form, Server Side Language, Form processing, Database system, Website Testing.

Course Name	:	**Databases Design and Management (1)**	**Course Number**	:	**30801243**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801210**

Basic concepts and terminology, database, database administrator, database management systems, characteristics of the database approach, the three level-schema architecture, data independence, the entity relationship model, notations and concepts, the relational model (concepts, constraints and operations), relational algebra, ER to relational mappings, the SQL language, functional dependencies and normalization.

Course Name	:	**Databases Design and Management LAB (1)**	**Course Number**	:	**30801244**
Credit Hours	:	**[1] Th. : [0] Pra. : [3]**	**Prerequisites**	:	**30801243***

Introduction to SQL and environment setup, Working with SQL to query database , create and manage users, Creating schema, DDL statements including CREATE , DROP and ALTER statements , DML including INSERT, UPDATE and DELETE statements, TRUNCATE statement, Retrieving data using the SELECT statement, Restricting and sorting data, Working with single-row functions, Conversion functions and conditional expressions, Reporting aggregated data using the group functions, Displaying data from multiple tables, using subqueries to solve queries, Set operators.

Course Name	:	**Visual Programming for Computer Graphics**	**Course Number**	:	**30807311**
Credit Hours	:	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	:	**30801205**

Introduction to visual programming, introduction to smart, devices, operating system for smart devices, cross-platform applications, event-driven programming, properties and methods, construction of graphical user interfaces, graphical user interface design, prototyping, evaluation, implementation, controls, toolboxes, menus and toolbars, sounds and multimedia, visual developing environment, database and Internet connectivity.

Course Name	**:**	**Graduation Project (1)**	**Course Number**	**:**	**30807471**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**90Cr. Hrs**

The student is expected to apply his accumulative experience and knowledge through the courses that he had already studied in this program as a graduation project. The student is required to accomplish his project goal and to submit his final report. This project will be discussed by the project supervisor.

Course Name	**:**	**Graduation Project (2)**	**Course Number**	**:**	**30807472**
Credit Hours	**:**	**[3] Th. : [0] Pra. : [0]**	**Prerequisites**	**:**	**30807471**

The student is expected to put into action his knowledge gained from the different courses in this study plan through a graduation project.

Course Name	**:**	**Field Training for Computer Graphics Students**	**Course Number**	**:**	**30807473**
Credit Hours	**:**	**[6] Th. : [0] Pra. : [0]**	**Prerequisites**	**:**	**90Cr. Hrs**

Practical training in the field, where students should register as trainees in IT sector, under the supervision of the department.

Course Name	**:**	**Image Processing & Computer Vision**	**Course Number**	**:**	**30801455**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801281**

Introduction to image processing, introduction to machine vision, human visual system, image acquisition, image enhancement in spatial and frequency domains, color image processing, image compression and analysis, image segmentation, morphological image processing, image restoration, illumination modeling, edge detectors, binary image processing, computational vision, motion vision, object recognition, object representation alignment, scale-invariant feature transform, gesture recognition.

Course Name	**:**	**Principles of Computer Graphics**	**Course Number**	**:**	**30807222**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30807121, 30801101**
Introduction to computer graphics, graphics pipeline, 2-d graphics, modeling, rendering, basics of image processing, geometric transformations, line drawing algorithms, geometric modeling of curves and surfaces, animation, 3-d viewing, visibility algorithms, shading, ray tracing, texture mapping algorithms.					

Course Name	**:**	**Special Topics in Computer Graphics+**	**Course Number**	**:**	**30807463**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**90Cr. Hrs**
Students are introduced to advanced selected topics in different areas of graphics computing not covered in other courses. The topics covered vary from year to year, depending on the students and staff.					

Course Name	**:**	**Parallel Computation for Computer Graphics**	**Course Number**	**:**	**30807318**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30807222**
Fundamentals of parallel programming: abstract models of parallel computers, parallel algorithms and data structures, and common parallel programming patterns including task parallelism, undirected and directed synchronization, data parallelism, divide-and-conquer parallelism, and map-reduce.					

Course Name	**:**	**Advanced Computer Graphics**	**Course Number**	**:**	**30807325**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801281**
Studies design, analysis and implementation of advanced computer graphics techniques. Topics include shades, using the GPU for high performance computing, graphics programming on embedded devices such as mobile phones; advanced graphics techniques such as ray tracing					

Course Name	**:**	**Game Programming**	**Course Number**	**:**	**30807351**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801205**

Provide introductions to event driven programming, game engine scripting, game engine class structures, learning to plan and to report on a significant programming project, learn to work in programming in teams, and learn to use standard game development environments, in particular the Unity3d development platform.

Course Name	**:**	**Games Design**	**Course Number**	**:**	**30807452**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30807351**

Gaming history, traditional game design theory, psychological, sociological, physiological, and economic aspects of games and gaming. A strong emphasis of this class will be on deconstruction and critique of popular computer and console games and genres. Analyze a variety of board, card and dice games, and then create their own prototype for the entire class to play/test.

Course Name	**:**	**Games & Artificial Intelligence**	**Course Number**	**:**	**30807453**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30807351**

Examine both traditional and modern AI techniques that are used in the design of computer games. Techniques for game playing as well as the design of AI opponents tasked with creating “good experiences” for players. Discussion of AI in general, as well as common algorithms, data structures, and representations. Topics in character movement, pathfinding, decision making, strategy, tactics, and learning—all within the context of computer games.

Course Name	**:**	**Image Processing & Computer Vision**	**Course Number**	**:**	**30801455**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30801281**

Digital image fundamentals: representation, sampling and quantization, image acquisition, basic relationships between pixels, imaging geometry. Image transforms: discrete Fourier transform, discrete cosine transform, Walsh and Hadamard transforms, Hotelling transform. Image enhancement: in spatial domain and in frequency domain, image smoothing and sharpening. Image restoration: degradation models, inverse filter, Wiener filter. Color and pseudo-color image processing. Image segmentation: detection of discontinuities, thresholding, region-oriented segmentation, the use of motion analysis in segmentation.

Course Name	**:**	**Discrete Structures and Mathematics**	**Course Number**	**:**	**30801214**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30202101**

Introduction to Logic, Propositional Logic, Predicate Logic, Formal and Informal Proofs, Sets, Set Operations. Functions, Countable and Uncountable Sets. Integers and Modular Arithmetic, Sequences, Summations, Mathematical Induction, Recursion, Counting, Permutations, Combinations, Probability, Relations, Graph Theory, Trees.

Course Name	**:**	**Principles of Numerical Analysis**	**Course Number**	**:**	**30801281**
Credit Hours	**:**	**[3] Th. : [3] Pra. : [0]**	**Prerequisites**	**:**	**30202102**

This course analyzed the basic techniques for the efficient numerical solution of problems in science and engineering. Topics spanned root finding, interpolation, approximation of functions, integration, differential equations and direct and iterative methods in linear algebra.