



الجامعة الألمانية الأردنية
German Jordanian University

German Jordanian University

School of Computing

Department of Computer Science

Bachelor of Science in Game Design and Media
Informatics

(A joint program with the Department of Design and Visual
Communication at School of Architecture and Built
Environment)

Study Plan of 2025

I. Program Vision

To graduate highly qualified people with a Bachelor of Science degree in design and media informatics and strong capabilities of developing and designing human-centered and user-friendly applications interacting with different types of data.

II. Program Mission

To arm students with the required knowledge and experience in the field of design and media informatics that enable them to fulfill society and market needs.

III. Program General Description

The study plan for the Bachelor of Science in Design and Media Informatics focuses on the practical side of the industry, embracing the latest technologies and techniques in digital media, design, and information technology. The modern information society needs creative minds that can bridge the gap between design and computer science in the development of innovative media applications. Therefore, design and media informatics deals with the conception, development, implementation and operation of hardware and software systems for the production, distribution and use of (digital) media. The aim of the education is to provide students with a good start to their careers with a course of study aimed at practical professional skills in the following areas: software engineering and development, web/mobile application development, database design and development, user interface design and development, computer graphics/animation and media-oriented software applications.

IV. Program Objectives

The primary objectives of the undergraduate program in design and media informatics are to:

- a. Create an understanding of the fundamentals of information, media, and design technologies.
- b. Create an understanding of the visual computing (e.g., computer graphics, computer vision, visualization, and mixed reality), multimedia applications (e.g., web-based or mobile applications), and tangible computing.
- c. Provide interdisciplinary education in which graduates acquire knowledge and skills in the creative and user-centered design of media and their development processes.
- d. Build an awareness of design and media informatics in industry and emerging technologies, emphasizing a working knowledge of current design tools and development techniques.
- e. Provide a broad education that enables graduates to understand the impact of human-centered and user-friendly applications in a societal context.
- f. Provide design and media informatics education that enables our graduates to pursue rewarding professional careers, graduate studies, and lifelong learning.

V. Program Learning Outcomes (PLOs)

PLO 1: An ability to identify, analyze, and solve problems in design and media informatics by applying foundational knowledge of information, media, design technologies, algorithms, programming, and software design to develop user-friendly applications across various platforms.

PLO 2: An ability to design and develop innovative solutions by integrating visual computing (e.g., computer graphics, computer vision, mixed reality), multimedia applications, and tangible computing with creative and user-centered approaches.

PLO 3: An ability to acquire and apply interdisciplinary knowledge, bridging design principles, digital media tools, and technological development processes to create engaging and functional media applications.

PLO 4: Demonstrate an awareness of emerging technologies, contemporary tools, and industry trends, applying these to solve complex problems and create human-centered and sustainable applications that address societal, cultural, and global challenges.

PLO 5: An ability to effectively communicate and collaborate within interdisciplinary teams, demonstrating leadership, project management, and adherence to ethical and professional standards in computing and design practices.

PLO 6: The capability to utilize freehand drawing, typography, digital photography, and visual communication theory, combined with cutting-edge tools, to create innovative and aesthetically compelling digital media solutions.

PLO 7: A commitment to learning by integrating current design trends, emerging technologies, and best practices into the continuous development of professional skills, academic growth, and societal contributions.

Course Delivery Methods

Courses are in one of the following three methods:

Face-to-Face (F2F) Method: Courses taught through face-to-face learning are delivered at the university campus.

Blended (BLD) Method: Courses in which teaching consists of face-to-face learning and asynchronous E-learning. The face-to-face learning takes place at the university campus. Asynchronous E-learning occurs through activities, tasks, educational duties, and assignments through the virtual E-learning platforms (Moodle and MyGJU) without direct meetings with course instructors.

Online (OL) Method: The course is designed to include both synchronous and asynchronous e-learning. During synchronous e-learning sessions, instructors and students participate in interactive virtual meetings through the virtual e-learning platform MS Teams. On the other hand, asynchronous e-learning involves activities, tasks, educational duties, and assignments that are completed through the virtual e-learning platforms Moodle and MyGJU without direct meetings with course instructors.

I. Admission Requirements

- The Jordanian General Secondary Certificate or an equivalent certificate with a minimum average of 70% (Scientific or Arts track) for applicants to the B.A. Program in Design and Visual Communication.

Placement Tests

Applicants must sit for placement tests in the Arabic Language, English Language, and Mathematics to determine whether the applicant may be required to take remedial courses in the mentioned subjects. Depending on the applicant's scores in the placement tests, some of the following 3-credit-hour remedial courses are required:

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
ARBO099	Elementary Arabic	3	3	3	-	OL	Placement test
ENGL0098	Elementary English	3	3	3	-	F2F	Placement test
ENGL0099	Intermediate English	3	3	3	-	F2F	ENGL0098
MATH0099	Pre-Math	3	3	3	-	OL	Placement test
Total		12	12	12	0		

- Remedial courses are to be completed and passed within the first year of enrollment.
- Passing grade of remedial courses is 60%.
- ECTS (B.Sc.): is the European Credit Transfer and Accumulation, One ECTS is equivalent to 30 actual workload hours.

II. Degree Requirements

The requirements to obtain a B.Sc. degree in Design and Media Informatics are the following:

- a. A minimum of 12 credit hours of elective courses are to be taken at a partner university in Germany.
- b. A minimum of 12 credit hours of International Training to be conducted at an industrial company in Germany.
- c. Passing all credit hours.

III. Framework for B.Sc. Degree (Credit hours)

Classification	Credit Hours			ECTS		
	Compulsory	Elective	Total	Compulsory	Elective	Total
University Requirements	21	6	27			
School Requirements	23	0	23		-	
Program Requirements	83	12	95			
Total	127	18	145			

Course Delivery Method	Credit Hours	Percentage
Online Courses	15	10
Blended Courses	54	37
Face-to-Face Courses	76	53
Total	145	100%

1. University Requirements: (27 credit hours)

1.1 Compulsory: (21 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
ARB100	Arabic		3	3	3	-	OL	ARB0099
ENGL1001	Upper-Intermediate English		3	3	3	-	F2F	ENGL0099
ENGL1002	Advanced English		3	3	3	-	F2F	ENGL1001
GERL101B1	German I B1-Track		3	6	9	-	F2F	-
GERL102B1	German II	B1-Track	3	6	9	-	F2F	GERL101B1
GERL102B2		B2-Track						
MILS100	Military Science		3	2	3	-	OL	-
NE101	National Education		3	2	3	-	OL	-
NEE101	National Education in English						OL	-
Total			21	25	33	0		

1.2 Elective: (6 credit hours) (Two courses out of the following)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
DES101	Arts' Appreciation		3	3	3	-	OL	ENGL0098,

							ARB0099
EI101	Leadership and Emotional Intelligence	3	3	3	-	F2F	ENGL0098
IC101	Intercultural Communications	3	3	3	-	F2F	ENGL0098
PE101	Sports and Health	3	3	3	-	F2F	ARB0099
SE301	Social Entrepreneurship and Enterprises	3	3	3	-	F2F	ENGL0098
SFTS101	Soft Skills	3	3	3	-	OL	ENGL0098
BE302	Business Entrepreneurship	3	3	3	-	OL	ENGL0098
TW303	Technical and Workplace Writing	3	3	3	-	OL	ENGL0098
Minimum required		6	6	6	0		

2. School Requirements: (23 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
CS116	Computing fundamentals		3		3	0	F2F	-
CS1160	Computing fundamentals lab		1		0	3	BLD	CS116 ^{CO}
MATH101	Calculus I		3		3	0	BLD	
MATH102	Calculus II		3		3	0	F2F	MATH101
EE317	Linear Algebra		3		3	0	BLD	MATH101, MATH102 ^{CO}
CS117	Object-Oriented Programming		3		3	0	F2F	CS116, CS1160, ARB0099, ENGL0099,
CS1170	Object-Oriented Programming Lab		1		0	3	BLD	ARB0099, ENGL0099, CS117 ^{CO}
GERL201B1	German III	B1-Track	3	4	6	-	F2F	GERL102B1 or GERL102B2 ARB0099, ENGL0099
GERL201B2		B2-Track						
GERL202B1	German IV	B1-Track	3	6	9	-	F2F	GERL201B1 or GERL201B2 ARB0099, ENGL0099
GERL202B2		B2-Track						
Total			23		30	6		

3. Program Requirements (95 credit hours)

3.1 Compulsory Requirements

3.1.1 Program Requirements (Compulsory): (95 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
ARC111	Fundamentals of Design I		4		2	4	F2F	-
DES1204	Visual Design: Tools		3		0	6	F2F	-
DMI1500	Fundamentals of Game Design and Media Informatics		4		2	4	F2F	CS116, CS1160
DES2503	Filmmaking		3		1	4	BLD	DMI1500
DMI2200	Digital Typography		3		2	2	F2F	DMI1500
DMI2340	3D Modelling		3		0	4	BLD	DMI1200
DMI2350	Animation		3		1	3	BLD	DMI2340
DMI3360	Game Design		3		1	4	BLD	DMI2350
DMI3340	UX/UI Design		3		1	4	F2F	DMI3360
CS430	Virtual and Augmented Reality		3		1	4	F2F	DMI2350
CS333	Game Programming		3		2	2	F2F	CS254, CS223,
DMI1200	Game Storyboarding		3		0	6	F2F	
CS222	Theory of Algorithms		3		3	0	F2F	CS116, CS1160, ARB099, ENGL099
CS223	Data Structures		3		2	2	F2F	CS116, CS1160, ARB099, ENGL099
CS451	Artificial Intelligence		3		3	0	F2F	CS222, CS223
CS263	Database Management Systems		3		2	2	BLD	CS117, CS1170, ARB099, ENGL099
CS355	Web Technologies		3		2	2	BLD	CS117, CS1170, CS263
CS477	Mobile Computing		3		2	2	BLD	CS117, CS1170, CS263
CS330	Image Understanding		3		2	2	F2F	CS223, EE317
CS332	Computer Graphics		3		2	2	F2F	CS223, EE317
DMI3900	Field Training		0		160 hours		F2F	Completion of 90 Cr. Hr.
DMI4910	International Internship		12			36	F2F	DMI3900, BSC001
DMI3902	Senior Project		3		0	9	BLD	DES2503, DMI2350, Completion of 90 Cr. Hr.
GERL301B1	German V	B1-Track	3		9	-	F2F	GERL202B1 or GERL202B2

GERL301B2		B2-Track						GERL202B2
GERL302B1	German VI	B1-Track	3		6		F2F	GERL301B1 or GERL301B2
GERL302B2		B2-Track						GERL301B2
Total			83		47		104	

Program Requirements (Electives b): (12 credit hours)

A minimum of 12 credit hours of coursework are required. This list is open for modifications based on school council decisions.

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
DMI3150	Interactive Design	3		1	4	BLD	-
DMI3160	Film Animation	3		1	4	BLD	-
DMI4180	Digital Media Technology	4		1	4	F2F	-
DMI5170	Creative Design Studio	3		1	4	F2F	-
DMI474	Human-Computer Interaction	3		3	0	BLD	CS117
DMI388	Special Topics in Game Programming	3		3	0	BLD	CS254
DMI389	Special Topics in Design and Media Informatics	3		3	0	BLD	-
CS342	Software Engineering	3		3	0	BLD	CS117, CS1170, CS263
CS365	Systems Analysis and Design	3		3	0	BLD	CS222, CS223
CS439	Computer Animation	3		3	0	F2F	CS332
CS459	Scientific Visualization	3		3	0	BLD	CS222, CS223, CS263
CS357	Cybersecurity	3		3	0	BLD	CS263
CS364	Information Retrieval	3		3	0	BLD	CS263
CS356	Information Security	3		3	0	BLD	CS263
CS460	Data Mining	3		3	0	BLD	CS263
CS462	Database Design	3		3	0	BLD	CS263
CS358	Multimedia Systems Design	3		3	0	BLD	CS223, EE317
CS481	Special Topics in Computer Graphics	3		3	0	BLD	CS332
CS482	Special Topics in Software Engineering	3		3	0	BLD	CS342
CS4833	Special Topics in Applied Computer Science	3		3	0	BLD	CS222, CS223
CS4832	Special Topics in Applied Computer Science	2		3	0	BLD	CS222, CS223
CS4831	Special Topics in Applied Computer Science	1		2	0	BLD	CS222, CS223
CS484	Special Topics in Database Technologies and Applications	3		1	0	BLD	CS263
CS4813	Special Topics in Artificial Intelligence	3		3	0	BLD	CS451
DES432	Visualization in Design	3		1	4	F2F	-

DES411	Information Design	3		1	4	BLD	-
DES3402	Web Design and Application	3		3	0	BLD	DES2505

^bXXXX0000 International Internship is a prerequisite for all elective courses

Study Plan Guide for a B.Sc. Degree in Design and Media Informatics (145 Credit Hours)

First Year							
First Semester							
Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
CS116	Computing Fundamentals	3		3	0	F2F	__
CS1160	Computing fundamentals lab	1		0	3	BLD	CS116 ^{CO}
DMI1200	Game Storyboarding	3		0	6	F2F	__
ARC111	Fundamentals of Design I	4		2	4	F2F	
GERL101B1	German I B1-Track	3		9	0	F2F	__
ENGL1001	Upper-Intermediate English	3		3	0	OL	__
MATH101	Calculus I	3		3	0		
Total		20		20	13		

First Year							
Second Semester							
Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
DMI1500	Fundamentals of Game Design and Media Informatics	4		2	4	F2F	ARC111
DES1204	Visual Design: Tools	3		0	6	F2F	ARC111
CS223	Data structures	3		2	2	F2F	CS116, CS1160, ARB099, ENGL099
CS117	Object-Oriented Programming	3		3	0		CS116, CS1160
CS1170	Object-Oriented Programming Lab	1		0	3		CS116, CS1160 ^{CO} , CS117 ^{CO}
GERL102B1	German II B1 track	3		9	-	F2F	GERL101B1
GERL102B2	German II B2 track					BLD	GERL101B2
MATH102	Calculus II	3		3	0	F2F	MATH101
Total		20		19	15		

Second Year								
First Semester								
Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
EE317	Linear Algebra		3		3	0	BLD	MATH101, MATH102 ^{CO}
CS263	Database Management Systems		3		2	2	BLD	CS117, CS1170, ARB099, ENGL099
CS222	Theory of Algorithms		3		3	0	F2F	CS116, CS11660, ARB099, ENGL099
	University Elective Requirement 1		3		3	-		-
DMI2200	Digital Typography		3		2	2	F2F	DMI1500
DMI2340	3D Modelling		3		0	4	BLD	DMI1200
GERL201B1	German III	B1-Track	3		6	-	F2F	GERL102B1 or GERL102B2, ARB099, ENGL0099
GERL201B2		B2-Track						
GERL201B1		B1-Track						
Total			21		19	8		

Second Year								
Second Semester								
Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
DES2503	Filmmaking		3		1	4	BLD	DMI1500
CS355	Web Technologies		3		2	2	BLD	CS117, CS1170, CS263
DMI2350	Animation		3		1	3	BLD	DMI2340
CS451	Artificial Intelligence		3		3	0	F2F	CS222
NE101 OR NEE101	National Education OR National Education in English		3		3	0	OL	ENGL0099
ENGL1002	Advanced English IV		3		3	0	F2F	ENGL0098
GERL202B1	German IV	B1-Track	3		9	-	F2F	GERL201B1 or GERL201B2, ARB099, ENGL0099
GERL202B2		B2-Track						
Total			21		22	9		

Third Year								
First Semester								
Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
CS333	Game Programming		3		2	2	F2F	DMI2350
CS430	Virtual and Augmented Reality		3		1	4	BLD	DMI2350
CS332	Computer Graphics		3		2	2	F2F	CS223, EE317
	University Elective Requirement 2		3		3	-		-
DMI3360	Game Design		3		1	4	BLD	DMI2350
ARB100	Arabic		3		3	0	OL	ARB0099
GERL301B1	German V	B1-Track	3		9	-	F2F	GERL202B1 or GERL202B2
GERL301B2		B2-Track						GERL202B2
Total			21		21	12		

Third Year								
Second Semester								
Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
DMI3902	Senior Project		3		0	6	BLD	DES2503, DMI435, Completion of 90 C.H.
CS330	Image Understanding		3		2	2	F2F	CS223, EE317
DMI3340	UX/UI Design		3		1	4	F2F	DMI3360
CS477	Mobile Computing		3		2	2	BLD	CS117, CS1170, CS263
MILS100	Military Science		3		3	0	OL	4th year
GERL302B1	German VI	B1-Track	3		6	-	F2F	GERL301B1 or GERL301B2
GERL302B2		B2-Track						GERL301B2
DMI390	Field Training		0		160 hours		F2F	60 credit hours/ Dept. Approval
Total			18		14	14		

Fourth Year							
First Semester							
Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
	elective course	3		3	0	BLD	BSC001
	elective course	3		3	0	BLD	BSC001
	elective course	3		3	0	BLD	BSC001
	elective course	3		3	0	BLD	BSC001
Total		12		12	0		

Fourth Year							
Second Semester							
Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
	International Internship	12		20 weeks		F2F	Dept. Approval
Total		12		0	0		

°Courses attended and/or passed during International Internship are not transferable

Prerequisite courses for the German year

Passing the following courses:

- CS222 Theory of Algorithms
- CS223 Data Structures
- CS355 Web Technologies
- DMI1500 Fundamentals of Game Design and Media Informatics
- DMI2350 Animation
- DES2503 Filmmaking

VI. Compulsory Courses Offered by the Department of Computer Science or the Department of Design and Visual Communication

CS116: Computing Fundamentals

3 Cr Hr (3,0)

Basic computer skills, programming concepts, algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.

Prerequisites: N/A

CS1160: Computing Fundamentals Lab

1 Cr Hr (0,3)

Lab session every week to offer hands-on experience on the topics that are covered in CS116, which are: algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.

*Prerequisites:
CS116^{co}*

CS117: Object-Oriented Programming

3 Cr Hr (3,0)

Object Oriented Programming concepts, Classes, objects and data abstraction, constructors and destructors; object-oriented design, encapsulation and information hiding, abstraction and modularization, coupling and cohesion, sample design patterns; inheritance, class and type hierarchies, polymorphism, Abstract classes, Interfaces, Packages, Collection classes, Generics, streams and files, exception handling; unit testing and debugging, Application Programming Interfaces, Javadoc.

*Prerequisite:
CS116, CS1160*

CS1170: Object-Oriented Programming Lab

1 Cr Hr (0,3)

Lab session every week to enhance hands-on experience on topics that are theoretically covered in CS117, which are: Object Oriented Programming concepts, classes, objects and data abstraction, Constructors and destructors; object-oriented design; encapsulation and information hiding, abstraction and modularization, coupling and cohesion, sample design patterns, inheritance class and type hierarchies, polymorphism, Abstract classes, Interfaces, Packages, Collection classes, Generics, streams and files, exception handling, unit testing and debugging, Application Programming Interfaces, Javadoc.

Prerequisites: CS116, CS1160^{co}, CS117^{co}

CS222: Theory of Algorithms**3 Cr Hr (3,0)**

Complexity bounds and asymptotic analysis, standard complexity classes, empirical measurements of performance, time and space tradeoffs in algorithms, mathematical analysis of recursive and non-recursive algorithms, algorithm design strategies, backtracking algorithms, dynamic programming, sorting algorithms, string matching, graph algorithms, optimization algorithms.

*Prerequisite: CS116,
CS1160, ARB0099,
ENGL0099*

CS223: Data Structures**3 Cr Hr (2,2)**

Advanced C language applications (Structures, Pointers), Lists, stacks and queues; hash tables; binary search trees; balanced trees, B-Trees, graphs; depth- and breadth-first traversals; shortest- path algorithms; transitive closure; minimum spanning tree; topological sort; implementation strategies for data structures; strategies for choosing the right data structure.

Prerequisite: CS116, CS1160, ARB0099, ENGL0099

CS332: Computer Graphics**3 Cr Hr (2,2)**

Basic concepts of computer graphics, general features of graphics hardware, raster graphics versus vector graphics, drawing primitive objects: lines, poly-lines, polygons, circles, ellipses, curves; filling methods: scan-line fill and flood fill; Basic two-dimensional (2D) geometric transformations: translation, rotation, scaling and reflection; 2D composite transformations, 2D viewing: clipping window and windowing transformation; basic three-dimensional (3D) geometric transformations: translation, scaling, rotation and reflection; composite 3D geometric transformations, viewing a 3D scene: setting a 3D viewing-coordinate reference, transformation from world to viewing coordinates; projection transformations, 3D object representations: lines, planes, polyhedral, curved surfaces, spheres, ellipsoids; visible-surface detection methods, illumination models and surface-rendering methods, shadow mapping, transparency and surface rendering, interactive graphics.

Prerequisite: CS223, EE317

CS263: Database Management Systems**3 Cr Hr (2,2)**

DBMS Architecture, Storage Hierarchy, Indexes, Entity-relationship (E-R) modeling, The relational model, Relational Query Language (SQL), Query processing and optimization, Creation and manipulation of databases; Indices and views; Access rights management; Programming in SQL; Transaction Processing (Transactional properties, Concurrency control, Locking, and Crash recovery); Data dictionaries; Required software tools: A main-stream commercial DBMS such as MS SQL, Oracle.

Prerequisite: CS117, CS1170, ARB0099, ENGL0099

CS451: Artificial Intelligence**3 Cr Hr (3,0)**

Mathematical principles of AI; introducing several AI approaches and techniques and their underlying mathematical/algorithmic structure. Problems; problem spaces, and search. Heuristic search techniques, simulated annealing, genetic algorithms and Tabu search. Knowledge representation and logic; Constraint logic programming; Statistical reasoning; Fuzzy set theory and reasoning; Neural networks.

Prerequisite: CS222, CS223

CS330: Image Understanding**3 Cr Hr (2,2)**

This course explores several algorithms for extracting useful semantic content from image data. In general, the course theme spans over three main topics: image processing, features and matching, and image analysis. In

particular, the course will include algorithms and techniques related to feature extraction, edge detection, SIFT, Harris Corner detection, feature selection, camera models, homography, stereo vision, image search, image classification, objection detection, HOG detector, and image segmentation. The course enables students to work with real applications including real images, e.g., urban street images and medical images.

Prerequisite: CS223, EE317

CS430: Virtual and Augmented Reality

3 Cr Hr (2,2)

VR systems: Discipline, features, Architecture. VR hardware: tracking systems, motion capture systems, visual displays. Fundamentals of the human visual system. Haptic rendering: Haptic sense. Haptic devices. Algorithms for haptic rendering. VR software development: Challenges in VR software development. Windowing, viewing, input/output, networking. Master/slave and Client/server architectures. Cluster rendering. Game Engines. Publicly available sdk for different hardware (HTC VIVE, Oculus, Google VR). AR software development: AR software. Camera parameters and camera calibration. Marker-based augmented reality. Pattern recognition. AR Toolkits.

prerequisite: CS254, CS223

CS355: Web Technologies

3 Cr Hr (2,2)

This course explores topics in Internet and Web technology; Mobile components; Event handling: detection, notification, and response; Web applications development; Standard web services and protocols: WSDL, and UDDI, and SOAP; Design of web services and applications within a service-oriented architecture; Web application languages: HTML, XML, and scripting languages; Programming techniques for consumption and implementation of web services; Server web applications; Java servlets, and Java Server Pages; PHP basics; PHP forms and sessions; Databases connection with SQL and PHP. The practical part of this course will focus on training the students on various web development tools, like HTML, XML, and PHP.

Prerequisite: CS117, CS1170, CS263

DMI1500: Fundamentals of Game Design and Media Informatics

3 Cr Hr (2,4)

A project-based course introduces students to the foundational principles of game design and digital media informatics. It covers core concepts such as interactive storytelling, level design, game mechanics, and user experience, alongside essential digital media components like screen-based animation, graphic design, and motion graphics. Students will explore the relationship between composition, color theory, typography, and UI design to create engaging visual narratives for games. The course also examines the role of digital media in gaming, social media, and multimedia production for web and mobile platforms. Through hands-on projects, students will develop industry-relevant skills, often working in collaboration with real-world clients to gain practical experience in game and digital media design.

Prerequisite: CS116, CS1160

ARC111 Fundamentals of Design I**4 Cr Hr (2,4)**

A project-based course; introduction to the basic principles of order using two- and three-dimensional compositions of basic design elements: point, line, and plane, addition and subtraction through the intersection of these elements and the potential elusive volumes that make space shapes: circle, square, and triangle; spatial organization: symmetry and balance, unity, repetition, and rhythm, transformation, and datum; order: focality and centralization radiality, linearity, and grid. The course will establish space explorations through movement and circulation. Additional emphasis will be on color theory, textures and tones. Class assignments will be based on abstract concepts while acquainting students with using different media and presentation techniques.

Prerequisite: N/A

DMI1200 Game Storyboarding**3 Cr Hr (0,6)**

This course introduces students to the essential techniques of storyboarding and the creation of animatics for film, animation, multimedia, and game projects. Emphasizing freehand sketching skills and illustration, students will learn to visually plan and organize scenes, sequences, and narratives through detailed storyboards. They will explore the process of creating animatics—animated storyboards—that help visualize timing, flow, and interactive elements in game development. Through hands-on projects, students will gain practical experience in crafting visual narratives, integrating storytelling with gameplay mechanics, and preparing storyboards for game production.

Prerequisite: N/A

DES1204 Visual Design: Tools**3 Cr Hr (0,6)**

A program compulsory practical course covering theoretical aspects of computer-based knowledge and various digital approaches to visual communication. Students learn vector and raster graphics, and image editing techniques. The course further addresses hands-on experience using state-of-the-art software packages to create 2D/3D graphics, sound, animation, and video.

prerequisite: N/A

DMI2200 Digital Typography**3 Cr Hr (2,2)**

This course introduces students to the principles of typography in digital media, focusing on both Arabic and Latin type systems. It covers readability, legibility, and aesthetics while exploring typographic hierarchy, grid systems, and type classifications. Through hands-on projects, students will develop skills in digital type design, motion typography, and interactive applications, using professional layout and design software to create effective and visually compelling typographic solutions.

prerequisite: DMI1500

DMI2350: Animation**3 Cr Hr (1,3)**

A visualization hands-on course that introduces students to basic methods and various techniques used to create 2D and 3D animations in order to create various Motion Graphics and compositions that can be used in a wide range of applications such as video editing, filmmaking, video game, animation and motion graphics. Students will understand the processes involved in the creation of 2D and 3D animation from concept to completion.

prerequisite: DMI2340

DMI2340: 3D Modeling**3 Cr Hr (0,4)**

An introductory course to the techniques used for modeling, texturing, lighting, rendering, and creating 3D content for games, cinematics, visual effects, animation, and visualizations. Students will gain a thorough applied foundation in the practice of 3D modeling, rendering techniques, texture, surface mapping, and the use of camera light.

prerequisite: DMI1200

DMI3360 Game Design**3 Cr Hr (1,4)**

A program compulsory course provides students with the knowledge and skills required to design and develop computer games. It integrates key concepts of game design methodology and implementation techniques. Topics include the basics of game engines, 2D/3D graphics and animation, sound design, interactivity, user interfaces, and multiplayer systems. Through hands-on projects, students explore object-oriented and component-based approaches to game design.

prerequisite: DMI2350

CS477: Mobile Computing**3 Cr Hr (2,2)**

An introduction to mobile computing with a strong emphasis on application development for the Android operating system. Topics will include Introduction to Android IDE, Layout & Activity, Preference and Service Menu, Thread (message), Thread (progress, post, broadcast, & Intent filter), Notification, Dynamic layouts, TTS, and clocks SQLite. This course will cover mobile phone programming components like UI programming, data management, localization, and programming sensors like the accelerometer and compass, and mobile OS services. The course will focus on the Android platform and how to use cloud services in applications. Android tablets will also be given.

prerequisite: CS117, CS1170, CS263,

DMI3340: UX/UI Design**3 Cr Hr (1,4)**

A project-based course that introduces students to design thinking, practices, processes, concepts and tools used in UX/UI design. This course provides the basics to key theoretical concepts - user experience design, user-centred design, human-computer interaction and digital design approaches - providing an opportunity to put these principles into practice. The course will cover individual and group ideation techniques; and contemporary perspectives on interactive design for common platforms (e.g., web, desktop, tablet, mobile, and beyond). Projects are preferably realized in co-operation with actual clients according to real-world demands.

prerequisite: DMI3360,

DES2503: Filmmaking**3 Cr Hr (1,4)**

A program compulsory introductory practical course providing a comprehensive introduction to the art and craft of film production, encompassing aesthetic, historical, theoretical, critical, and practical approaches to the cinematic medium. Students explore the language of cinema, screenwriting fundamentals, cinematography techniques, and sound design principles. The course also covers video editing techniques and explores the analysis of different film genres.

prerequisite: DMI1500,

CS333: Game Programming**3 Cr Hr (2,2)**

This course is a comprehensive introduction to the wide variety of topics within game programming, physics of games and AI in games. Primary learning outcomes of this course include a) using the Unity Editor to create exciting game levels, b) understanding the fundamentals of using 2D and 3D graphics, c) creating game scripts (e.g., using C++ and the Unity API), d) becoming acquainted with advanced topics such as shaders, physics, AI, and Network based games, and c) understanding the process of game development from idea to beta version.

prerequisite: CS254, CS223,

DMI390: Field Training**Cr Hr (0,0)**

Eight consecutive weeks of training where students must complete 160 hours of field training in approved industries in Jordan.

prerequisite: completion of 90 credit hours,

DMI491: International Internship**12 Cr Hr 36H/W**

Field training is a period of six month to be spent in the industry in Germany, under supervision of the academic faculty in Jordan and in Germany. Periodic reports and a final report need to be submitted for evaluation and an oral examination is required.

prerequisite: DMI390,

DMI3902 Senior Project**3 Cr Hr (0,9)**

This course represents the second phase of the senior capstone project. Students implement, test, and refine their proposed solutions, culminating in a fully functional system or product. The course concludes with two main components: (1) a final project report documenting the technical and design details of the solution, and (2) a formal presentation and demonstration to a faculty committee.

Elective Courses Offered by the Department of Computer Science or the Department of Design and Visual Communication

CS439: Computer Animation

3 Cr Hr (3,0)

Fundamentals of Computer Animation; Applications of Computer Animation; Animation principles and types; Interpolation; Differential equations; Key frame animation; Particle dynamics and systems; Body dynamics and systems; Procedural animation; Physics-based methods; Motion capture techniques; Image morphing; Object deformation; Controlling groups of objects; Data-driven motion synthesis; Character Animation: basic motion (reaching, grasping, walking), facial animation, fluid animation, inverse kinematics, inverse dynamics; Lighting, shading, and anti-aliasing; Space-time constraints; Mathematics optimization; High-level control; Hierarchical and articulated models; Statistical models; Advanced modeling and rendering.

Prerequisite: CS332

CS342: Software Engineering

3 Cr Hr (3,0)

The product and the process, Software project management: Basic concepts, Software process and project metrics, Software project Planning, Risk management, Project scheduling and tracking, Quality assurance, Configuration management; Classical approaches: Waterfall and Spiral models; Object-oriented approach; Unified Modeling Language (UML); Concepts and notations of object-oriented analysis: Base concepts; Static concepts; Dynamic concepts; Object-oriented analysis: Analytical process; Analysis patterns; Static model; Dynamic model; Design notations and diagram; Design patterns.

Prerequisite: CS117, CS1170, CS263

CS358: Multimedia Systems Design

3 Cr Hr (3,0)

This course covers the state-of-the-art technology for multimedia systems. This course introduces students to different media types (e.g., images, video, audio, graphics) and how they are used to create multimedia content and systems, algorithms and standards to compress and distribute them via networked systems to a variety of end clients. In general, the course includes issues related to a) content creation: media capture and representation, methods to assemble media types to create multimedia content; b) compression / Storage: students will study algorithms, protocols architectures related to compression; and c) distribution: Aspects of wired and wireless network distribution, Quality of Service, as well as digital rights management of distributed multimedia (watermarking & encryption). For each of the above ISO and ITU standards will also be addressed - JPEG, MPEG1, MPEG2, MPEG4, H.261, H.263, H.264, G.711, G.722, mp3, AAC, Dolby AC3, THX, surround sound, etc. We will also study applications and systems around multimedia – such as database applications with metadata (MPEG-7, MPEG-21). The course's goal will also be to explain modern distributed multimedia systems that take some or all of the above components to create practical applications, e.g., multimedia authoring, digital cinema, content management, multimedia databases, etc.

Prerequisite: CS223, EE317

CS462: Database Design**3 Cr Hr (3,0)**

Three-level information architecture: External schema; Conceptual schema; Logical data model; DB server/user toolkit architecture: Query languages; Report writers; Query and application development tools; Data-modeling: CASE tools; Relational technology fundamentals; Components of a relational DBMS; Relational Database design; Developing the logical data model; Mapping the data model to the relational model; Entity-relationship modeling; Normalizing data to design tables: Identifying functional dependencies; Applying rules for normalization; Implementing relational databases using a CASE tool; Physical database design; Manipulating and controlling a database using SQL; Creating views; Enforcing business rules for data integrity; Modeling in analysis and design; Creating an intelligent server; Creating informative data visualizations; Transactions and Database Security.

Prerequisite: CS263

CS364: Information Retrieval**3 Cr Hr (3,0)**

Introduction to Information Retrieval and Information Management from a user and design perspectives. The course covers formal models, evaluation and performance measurement, implementation structures and algorithms, and automatic organization of information including indexing, clustering, and NLP. Advanced topics include knowledge representation, semantic nets, fuzzy, and rough sets, web search, and internet technologies.

Prerequisite: CS263

CS356: Information Security**3 Cr Hr (3,0)**

This course covers fundamental issues surrounding information security and privacy. Course topics include confidentiality, integrity, availability; authentication models, protection models, security kernels, secure programming, audit, intrusion detection and response, operational security issues, physical security issues, personnel security, policy formation and enforcement, access controls, information flow; legal and social issues, identification and authentication in local and distributed systems, classification and trust modeling, risk assessment, data aggregation, behavioral advertising, privacy-preserving data mining, privacy-preserving data publishing, website privacy policies and practices, and anonymous communication.

Prerequisite: CS263

CS460: Data Mining**3 Cr Hr (3,0)**

The course introduces students to data mining, by studying their principles, algorithms, implementation methodology, and applications. It provides a comprehensive introduction to data mining, including data selection, cleaning, coding, using different pattern recognition techniques, and reporting; and introduce students to the applications of data mining by using commercial tools for creating business applications.

Prerequisite: CS263

DMI474: Human-Computer Interaction**3 Cr Hr (3,0)**

This subject is an introduction to human-computer interaction. Emphasis will be placed on understanding human behavior with computing systems, knowing how to design, and evaluate interactive software using a human-centered approach, and general knowledge of HCI design issues with multiple types of interactive software.

Prerequisites: CS117, CS1170, BSC001

DMI414: Information Design

3 Cr Hr (1,4)

A project-based course integrating conceptual communicative thinking and design as well as design of brochures, flyers, newsletters, manuals, information graphics, and other user-friendly publications, in a series of focused modules. Audience-awareness, collaboration, peer critique, editing, writing, and visual design, and Info Design blog are also addressed. Projects are preferably realized in co-operation with actual clients according to real-world demands.

Prerequisites: BSC001

DMI315: Interactive Design

3 Cr Hr (1,4)

It is a project-based course integrating conceptual communicative thinking and design as well as visual and audio communication, involving user actions, strategic design and the illusion of motion. Through individual approach and expression in traditional media, students experiment with the juxtaposition and sequence of design elements and imagery to develop a sense of artist-audience construct and consequence. Projects are preferably realized in co-operation with actual clients according to real-world demands.

Prerequisites: BSC001

DMI316: Film Animation

3 Cr Hr (1,4)

A project-based course integrating conceptual communicative thinking and design. Students define specific production goals to explore or complete an animation project of their choosing. Emphasis is on director's conceptual, aesthetic and technical decision-making processes. Students are encouraged to share their specific areas of expertise while producing individually directed projects and helping each other in these projects. Projects are preferably realized in co-operation with actual clients according to real-world demands.

Prerequisites: BSC001

DMI4180 Digital Media Technology

3 Cr Hr (1,4)

A project-based course that offers a comprehensive understanding of digital media technologies and their applications across various domains. Students will learn the tools, techniques, and methodologies essential for creating, managing, and delivering digital content. Topics covered include multimedia systems, digital storytelling, animation, interactive design, and web-based media.

Prerequisite: N/A

DMI5170 Creative Design Studio

3 Cr Hr (1,4)

A project-based course offering specialized, in-depth, and/or interdisciplinary exploration of a topic that complements various disciplines within Design and Visual Communication. The subject matter is guided by student interests and instructor expertise. The course emphasizes conceptual communication, design thinking, and methodology, alongside practical implementation techniques. It covers the design process from problem identification to detailed development and evaluation, focusing on creating competitive, high-quality outcomes.

Prerequisites: N/A

DES432 Visualization in Design

3 Cr Hr (1,4)

This course provides an opportunity for specialized or in-depth exploration of topics that complement the field of Design and Visual Communication. The subject matter is guided by student interests and instructor expertise. It aims to enhance students' communication skills and deepen their understanding of the design process. Students will engage in hands-on techniques for creating, manipulating, and constructing designs. By integrating

traditional craftsmanship with digital technology, students will visualize the design process from concept development to final realization, whether in 2D/3D graphics, sound, animation, video, or film.

DES3402 Web Design and Application

3 Cr Hr (3,0)

A program technical elective course providing students with an introduction to the principles and practices of web design and development. Students learn how to create visually appealing and user-friendly websites using industry-standard tools and technologies. The course covers key aspects of web design, including HTML, CSS, and JavaScript, and explores cutting-edge technologies in responsive design, user experience optimization, and front-end development. Through hands-on projects and real-world examples, students develop the skills needed to design, build, and maintain effective websites and web applications.

CS357: Cybersecurity

3 Cr Hr (3,0)

This course covers an essential range of topics for securing modern enterprises. Course topics include Cryptographic Tools, user authentication, database and cloud Security, malicious software, denial of service attacks, intrusion detection, firewalls and intrusion prevention systems, IT security management and risk assessment, human resources security, legal and ethical aspects, enterprise roles, security metrics, risk management, standards and regulations, physical security, and cybercrime issues and investigation.

Prerequisite: CS263

CS459: Scientific Visualization

3 Cr Hr (3,0)

Scientific visualization is concerned with the visual representation of numerical datasets obtained through measurements or computational simulations of natural phenomena. Visualization creates interactive graphical interfaces to datasets of ever-increasing size and complexity that affords scientists and engineers a powerful and intuitive basis for interpretation, assessment, and decision making. The course covers the fundamental principles of this discipline and describes the most prominent visualization techniques used in practice. In particular, the course presents basic and more advanced visualization algorithms for 2D, 3D, and time-dependent datasets corresponding to scalar, vector, and tensor attributes, as well as high-dimensional and non-spatial data. The lectures emphasize the practical applications of these techniques in science, engineering, and medicine.

Prerequisites: CS222, CS223, CS263

CS365: Systems Analysis and Design

3 Cr Hr (3,0)

Introduction to systems development; Development life cycle; System Development feasibility; Development of fact-finding methods; Context diagram; Data flow diagram; Decision tables and trees; Data dictionary; Installation; Training; Development Tools: Documentation, Maintenance, Conceptual design, DB design, Reverse engineering, Graphical user interface, Systems life cycle, System conversion, System charts and flow of control; Case study.

Prerequisites: CS222, CS223

DMI388: Special Topics in Game Programming

3 Cr Hr (3,0)

Selected state-of-the-art topics in game programming.

Prerequisites: CS254, BSC001

DMI389: Special Topics in Design and Media Informatics **3 Cr Hr (3,0)**

Selected state-of-the-art topics in media informatics.

Prerequisites: BSC001

CS482: Special Topics in Software Engineering **3 Cr Hr (3,0)**

Selected state-of-the-art topics in software engineering

Prerequisites: CS342

CS4833: Special Topics in Applied Computer Science **3 Cr Hr (3,0)**

Selected state-of-the-art topics in areas of applied computer science.

Prerequisites: CS222, CS223

CS4832: Special Topics in Applied Computer Science **2 Cr Hr (2,0)**

Selected state-of-the-art topics in areas of applied computer science.

Prerequisites: CS222, CS223

CS4831: Special Topics in Applied Computer Science **1 Cr Hr (1,0)**

Selected state-of-the-art topics in areas of applied computer science.

Prerequisites: CS222, CS223

CS484: Special Topics in Database Technologies and Applications **3 Cr Hr (3,0)**

Selected state-of-the-art topics in database technologies and applications.

CS481: Special Topics in Computer Graphics **3 Cr Hr (3,0)**

Selected state-of-the-art topics in computer graphics, animation and their applications.

Prerequisites: CS332

CS4813: Special Topics in Artificial Intelligence **3 Cr Hr (3,0)**

Selected state-of-the-art topics in artificial intelligence.

Prerequisites: CS451