ASSIUT UNIVERSITY



Faculty of Computers and Information Department of Multimedia



Multimedia PhD Program 2023-2024









Assiut University

Faculty of Computers & Information

Multimedia PhD Program



Assiut University Faculty of Computers & Information Quality Assurance Unit



MM Ph.D. Program

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Program Specifications 2023-2024



Assiut University Faculty of Computers & Information Quality Assurance Unit

MM Ph.D. Program Specifications



A. Basic Information

- 1. **Program Title:** Ph.D. in Computers and Information (Multimedia)
- 2. Program Type: Single
- 3. Faculty (Faculties): Faculty of Computers and Information
- 4. **Department:** Multimedia
- 5. Assistant Coordinator: Prof. Khaled Fathy Hassan
- 6. Coordinator: Prof. Khaled Fathy Hassan
- 7. Last date of program specifications approval:01/8/2024

B. Professional Information

1. Program Aims and Objectives

Successfully completing this program will contribute to some certain graduate attributes. Specifically, a graduate of Computers and Information (Multimedia) Ph. D. Program should be able to:

- I. To produce highly qualified researchers capable of independent and original scholarship in multimedia.
- II. To advance knowledge and understanding in the field of multimedia through cutting-edge research.
- III. To prepare graduates for leadership roles in academia, industry, and government related to multimedia technologies and applications.
- IV. To foster innovation and entrepreneurship in the creation and application of multimedia
- V. To contribute to the ethical and responsible development and use of multimedia technologies.
- VI. Conduct original research: Design, execute, and analyze research projects that contribute new knowledge to the field of multimedia. This includes formulating research questions, selecting appropriate methodologies, and interpreting results.
- VII. Creative application of technology: Apply technical skills to create innovative multimedia applications and experiences.
- VIII. Problem-solving: Solve complex technical and creative problems related to multimedia development and implementation.
 - IX. Multimedia Computing: Develop expertise in algorithms, data structures, and software engineering related to multimedia processing, storage, and retrieval.

- X. Interactive Media: Focus on the design and development of interactive multimedia experiences, including user interface design and human-computer interaction.
- XI. Digital Media Arts: Explore the creative and artistic applications of multimedia technologies, including digital storytelling, animation, and visual effects.
- XII. Work effectively in interdisciplinary teams and collaborate with researchers from other fields.
- XIII. Communicate complex technical and creative concepts clearly and effectively to both technical and non-technical audiences.
- XIV. Understand and apply ethical principles in the development and use of multimedia technologies.

2. Intended Learning Outcomes (ILOs)

a. Knowledge and Understanding

- Advanced Knowledge of Multimedia: Demonstrate a comprehensive and in-depth understanding of the core concepts, theories, and principles of multimedia, including its history, evolution, and current state.
- **Specialized Knowledge:** Possess expert knowledge in a specific area of multimedia, such as multimedia computing, interactive media, digital media arts, multimedia communication, or other chosen specialization.
- **Research Methodologies:** Understand and critically evaluate various research methodologies relevant to multimedia research, both qualitative and quantitative.
- Ethical and Social Implications: Demonstrate a strong understanding of the ethical, social, and cultural implications of multimedia technologies and their applications.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. Formulate research questions, develop robust research proposals, design, and independently execute rigorous research projects, adhering to ethical guidelines. (*Measurable through successful grant proposals, approved research proposals, and dissertation*)
- b2. Collect, analyze, and interpret data using appropriate statistical, computational, qualitative, or mixed methods, demonstrating critical evaluation of results. (*Measurable through publications, presentations, and dissertation*)
- b3. Conduct comprehensive and critical literature reviews, synthesizing information from diverse sources to identify research gaps and contribute to the body of knowledge. (*Measurable through literature review chapters in dissertation and publications*)
- b4. Demonstrate advanced proficiency in relevant multimedia technologies, tools, and platforms (e.g., programming languages, software applications, hardware platforms) specific to their chosen specialization. (*Measurable through project demonstrations, portfolio reviews, and dissertation*)
- b5. Solve complex technical problems related to multimedia development and implementation, and apply technical skills creatively to develop innovative solutions and applications. (*Measurable through project outcomes, publications, and patents (if applicable)*)
- b6. Effectively communicate research findings and ideas through clear, concise, and well-structured academic writing, adhering to discipline-specific standards for

publications and reports. (*Measurable through peer-reviewed publications, conference proceedings, and dissertation*)

- b7. Present research findings and ideas confidently and persuasively to diverse audiences, including academic peers, industry professionals, and the general public. (*Measurable through conference presentations, invited talks, and teaching evaluations*)
- b8. Create and innovate.
- b9. Talk and discuss based on proofs and evidences.
- b10. Utilize visual media effectively to communicate complex concepts, research results, and project outcomes in presentations, publications, and multimedia projects. (*Measurable through quality of presentations, visual components of publications, and multimedia project evaluations*)
- b11. Generate and apply innovative solutions to solve problems based on reasoned rationale.

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. Adhere to the highest ethical standards in research and professional practice, including responsible conduct of research, data management, authorship, and intellectual property. (*Measurable through coursework on research ethics, adherence to institutional review board* (*IRB*) guidelines, and professional conduct)
- c2. Demonstrate advanced critical thinking and analytical skills to evaluate information, identify problems, develop solutions, and make informed decisions in research and professional practice. (*Measurable through research proposals, problem-solving components of projects, and dissertation*)
- c3. Manage research projects effectively, including planning, budgeting, resource allocation, and timely execution. (*Measurable through successful completion of research milestones, grant management (if applicable), and dissertation progress)*
- c4. Work effectively in interdisciplinary teams, collaborate with researchers and professionals from other fields, and contribute constructively to group projects. (*Measurable through collaborative projects, team-based assessments, and letters of recommendation*)
- c5. Analyze, evaluate and synthesize research and apply theoretical ideas to practical settings.
- c6. Propose and design possible alternative directions for further work.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. Communicate efficiently by different means.
- d2. Use the information technology to develop the professional practice.
- d3. Educate the others and assess their performance.
- d4. Have a self-assessment and long-life learning.
- d5. Use different recourses to obtain information and knowledge.
- d6. Work productively in team or collaborative settings to achieve common goals or purposes including the ability to lead a team.
- d7. Manage scientific meeting with the ability to manage time.
- d8. Participate within the professional, legal and ethical framework within which they would be expected to operate as professionals within the IT industry.
- d9. Effectively present ideas, designs and solutions in a logical framework in a variety of forms with proper language structure and mechanics, and to produce appropriate written documentation.

d10. Make use of the qualities and transferable skills necessary for employment requiring concerning the exercise of initiative and personal responsibility, and decision making in complex and unpredictable situations.

3. Academic Standards

The academic standards invoked in this specification are driven from generic the standards in the "Guide of Academic Standards for Graduate Programs" published by the National Authority for Quality Assurance & Accreditation (NAQAAE) on March 2009.

4. Curriculum Structure and Contents

4a. Program duration: at least 2 years.

- **4b.** Program structure
 - No. of hours per week: Lectures (10), Lab./Tut. (0), Total (10)
 - No. of credit hours: Compulsory (18), Elective (12)
 - No. of hours of basic computing: ... credits, ...%
 - No. of hours of specialized multimedia courses: ... credits, ...%
 - Field Training: Not compulsory
 - Program Levels (in credit-hours system): Not applicable.

5. Program Courses

5a. Compulsory Courses

Course Code /	Course Title	Units No	No	o. of ho /week		Year	Semeste r	Achieved ILOs
No.			Lect	Lab	Exer			
MM700	Visualization	4	2	_	_	1 st	1 st + 2 nd	a1, a2, a4, a5, b1, b2, b5, b7, b9, b11, c1, c3, c4, c6, d1, d2,d5, d9
MM701	Augmented Reality Systems	4	2	_	_	1 st	1 st + 2 nd	a1, a2, a5, b1, b2, b9- b11, c1, c4, c6, c7, d1, d2, d5, d9
MM702	Rendering techniques	4	2	_	_	1 st	1 st + 2 nd	a1, a2, a4, a5, b1, b2, b5, b7, b9-b11, c1, c3, c4, c6, c7, d1, d2, d5, d9
ΤΟΤΑΙ		12	6	-	-			

5b. Elective Courses

Course	Course Title	Units	No. of	hours	/week	Year	Semester	Achieved ILOs
Code / No.		No	Lect.	Lab	Exer.	1000	Contester	
1	Elective Course I	4	2	_	_	1 st	1 st + 2 nd	a1, a2, a5, b1, b2, b9-b11, c1, c4, c6, c7, d1, d2, d5, d9
2	Elective Course II	4	2	_	_	1 st	1 st + 2 nd	a1, a2, a5, b1, b2, b9, b11, c1, c4, c6, c7, d1, d2, d5, d9
	TOTAL	12	4	-	_			

	Elective Course I		Elective Course II
Course Code	Course Title	Course Code	Course Title
NIN 1702	Advanced Multimedia	Advanced Topics In Human	
MM703	Communication	MM706	Computer Interaction
MM704	Digital libraries		
MM705	Advanced topics in multimedia		

5c. Ph. D. Thesis

No.	Title	Units No	Year	Semester	Achieved ILOs
1	Ph. D. Thesis	40	2 nd	1 st + 2 nd	a1- a5, b1 -b11, c1-c7, d1, d2, d4-d10

6. Contents of Courses

Syllabus: See below

7. Program Admission Requirements

High score in secondary school education certificate in (mathematic section).

8. Regulations for progression and program completion

Please, refer to faculty bylaw (curriculum of undergraduate programs), 2004, pages 4-5.

9. Student Assessment (Methods and rules for student assessment)

Method (tool)	Intended leaning outcomes assessed
1- Written examinations	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills
2- Oral examination	Knowledge and Understanding - Intellectual Skills - General Skills
3- Thesis	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills

10. Program Evaluation

Evaluator	Tool	Sample
1- Senior students		
2- Alumni	Questionnaire	
3- Stakeholders		
4-External Evaluator(s) (External Examiner(s))	Report	
5- Other		

Program Coordinator: Prof. Khaled Fathy Hassan

Signature: Khaled fathy Hussen

Date: 01/8/2024

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled Fathy Hussian

Date: 01/8/2024

Approved by the Dean: Prof. Taiseer Hassan Abdel-Hamid Sulaiman

Signature:

Date: 01/8/2024

Program Matrices



Assiut University Faculty of Computers & Information Department of Multimedia Quality Assurance Unit



MM PhD Program Matrices

The main description of Multimedia Program can be summarized in different types of matrices. These matrices are:

1. Academic Standards Matrix

This matrix shows theILOsinvoked in MM Program Specifications and those existing in NARS and the corresponding between them.

2. Program Matrix I (Courses - NARS General)

This matrix shows how MM Program Courses can cover the NARS general ILOs.

3. Program Matrix II (Courses - NARS Special)

This matrix shows how MM Program Courses can cover the NARS special ILOs.

- 4. Program Matrix III (Courses Knowledge and Understanding Skills) This matrix shows how MM Program Courses can cover Knowledge and Understanding Skills invoked in MM Program Specifications.
- 5. Program Matrix IV (Courses Intellectual Skills)

This matrix shows how MM Program Courses can cover Intellectual Skills invoked in MM Program Specifications.

6. Program Matrix V (Courses - Professional and Practical Skills)

This matrix shows how MM Program Courses can cover Professional and Practical Skills invoked in MM Program Specifications.

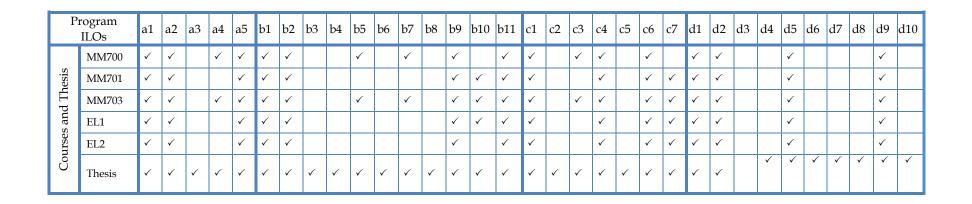
7. Program Matrix VI (Courses - Transferable Skills)

This matrix shows how MM Program Courses can cover Transferable Skills invoked in MM Program Specifications.



Assiut University Faculty of Computers & Information Department of Multimedia Quality Assurance Unit

MM PhD Program Matrices



Course Specifications and Reports 2023-2024





Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Ph.D. in Computers and Information
	(Multimedia)
Department offers the program	Multimedia
Department offers the course	Multimedia
Academic year	1st Year
Date of specification approval	01/8/2024

A. Basic Information

- 1. Course Title: Visualization
 - 2. Course Code: MM700
 - 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- **Developing Data Literacy:** To equip students with the skills and knowledge to understand, interpret, and effectively communicate data through visual representations. This includes understanding different data types, how to process data for visualization, and how to critically evaluate visualizations.
- **Mastering Visualization Principles:** To teach students the fundamental principles of visual perception, design, and effective communication. This includes understanding how people perceive visual information, how to choose appropriate chart types, how to use color and layout effectively, and how to avoid misleading visualizations.
- **Building Technical Proficiency:** To provide students with hands-on experience using visualization tools and technologies. This might include learning to use specific software packages (e.g., Tableau, Power

BI) or programming libraries (e.g., D3.js, Matplotlib, Seaborn). The focus here is on the practical skills needed to create visualizations.

- **Fostering Data Storytelling Skills:** To enable students to craft compelling narratives with data visualizations. This involves learning how to structure a story, how to highlight key insights, and how to tailor visualizations to different audiences.
- **Promoting Critical Evaluation:** To encourage students to think critically about the visualizations they create and encounter. This includes evaluating the effectiveness of different visualization techniques, recognizing potential biases or misinterpretations, and understanding the ethical implications of data visualization

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

- a1. Theories, fundamentals, and current state-of-the-art in Computer Science domain and their related domains.
- a2. Scientific research fundamentals, methodologies, ethics, and its various tools.
- a3. Related knowledge of professional practice effect on the environment and methods to develop and preserve it.
- a4. Quality principles for professional practice in Computer Science.
- a5. Learning the relations among software product, process and project in quality assurance and management.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **Data Preparation:** Clean, transform, and prepare data for visualization using appropriate tools and techniques.
- b2. **Visualization Creation:** Create effective and informative visualizations using various software packages or programming libraries.
- b3. **Chart Selection:** Select appropriate chart types and visualization techniques based on the data and the communication goal.
- b4. **Design Principles:** Apply design principles to create visually appealing and accessible visualizations.
- b5. **Data Storytelling:** Develop and present data-driven narratives using visualizations.
- b6. **Critical Evaluation:** Critically evaluate visualizations for effectiveness, accuracy, and potential biases.
- b7. **Software/Tool Proficiency:** Demonstrate proficiency in using specific visualization software (e.g., Tableau, Power BI) or programming libraries (e.g., D3.js, Matplotlib, Seaborn). (*This will be specific to the course*)

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

c1. **Real-World Applications:** Apply visualization techniques to real-world problems and datasets.

- c2. **Project Development:** Develop and complete visualization projects that address specific research questions or communication goals.
- c3. **Communication & Presentation:** Effectively communicate insights derived from visualizations to diverse audiences.
- c4. **Problem-Solving:** Use visualization as a tool for exploring data, identifying patterns, and solving problems.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. Communicate efficiently by different means.
- d2. Use the information technology to develop the professional practice.
- d3. Use different recourses to obtain information and knowledge.
- d4. Effectively make ideas, designs and solutions in a logical framework in a variety of forms with proper language structure and mechanics, and to produce appropriate written documentation.

3. Contents

No	No Topic taught -		f hours		ILOs	
INO	Topic taught	Lecture	Tut/Prac		ILOS	
1	What is visualization? Why is it	20	-	a1-a5,	b1-b5,	c1-c4,
	important? History and evolution			d1-d4		
	of visualization					
2	How humans perceive and	20	—	a1-a5,	b1-b6,	c1-c5,
	process visual information.			d1-d4		
	Gestalt principles, pre-attentive					
	processing, and cognitive load.					
3	Crafting compelling narratives	16	—	a1-a5,	b1-b6,	c1-c5,
	with data visualizations.			d1-d4		
	Structuring a story, highlighting					
	key insights, and tailoring					
	visualizations to different					
	audiences					

4. Teaching and Learning Methods

- **4a.** Lectures
- **4b.** Tutorial Exercises
- 4c. Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual professional and general skills.
Projects	To measure professional and general skills

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- **6a.** Course Notes
 - Short course notes available at the course homepage.
- **6b.** Required Books (Textbooks)
 - "The Visual Display of Quantitative Information" by Edward Tufte: A classic and highly influential book on the principles of effective data visualization. Focuses on clear communication and avoiding chart junk.

6c. Recommended Books

- "Envisioning Information" by Edward Tufte: Explores how to represent complex information visually, with a focus on clarity and elegance..
- 6d. Web Sites
 - Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>
- 7. Facilities Required for Teaching and Learning
 - A lecture hall equipped with projectors and computers.
 - Labs equipped with computers and Internet facilities.
 - A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled fathy Hussen

Date: 01/8/2024

		ISUAIIZATION								IVII					
			ILOs					Геас	0	and etho		5	Assessment Tools		
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d′s	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
- Developing Data Literacy: To equip students with the skills and knowledge to understand, interpret, and effectively	What is visualization? Why is it important? History and evolution of visualization	1-10	1-5	1-5	1-4	1-4	~	~						✓	
communicate data through visual representations. This includes understanding different data types, how to process data for visualization, and how to critically evaluate visualizations. -Mastering Visualization Principles: To teach students		11-20	1-5	1-6	1-5	1-4	~	~				V		\checkmark	

Course Matrix

Course Name Visualization

Course Code MM700

the fundamental principles of visual perception, design, and effective communication. This includes understanding how people perceive visual information, how to choose appropriate chart types, how to use color and layout effectively, and how to avoid misleading visualizations.	Crafting compelling narratives with data visualizations. Structuring a story, highlighting key insights, and tailoring visualizations to different audiences											
-Building Technical Proficiency: To provide students with hands-on experience using visualization tools and technologies. This might include learning to use specific software packages (e.g., Tableau, Power BI) or programming libraries (e.g., D3.js, Matplotlib, Seaborn). The focus here is on the practical skills needed to create visualizations.		21-28	1-5	1-6	1-5	1-4	✓	~	~	~	\checkmark	
-Fostering Data Storytelling Skills: To enable students to craft compelling narratives with data visualizations. This involves learning how to structure a story, how to highlight key insights, and how to tailor visualizations to different.												

Course Coordinator	Department Head	Prof. Khaled Fathy Hassan
Signature	Signature	Khaled Fathy Hussian

Augmented Reality Systems Augmented Reality Systems MM701



Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Ph.D. in Computers and Information
	(Multimedia)
Department offers the program	Multimedia
Department offers the course	Multimedia
Academic year	1st Year
Date of specification approval	01/8/2024

A. Basic Information

- 1. Course Title: Augmented Reality Systems
- 2. Course Code:MM701
- 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have :

- Foundational Understanding of AR: To provide students with a solid understanding of the core concepts, principles, and history of augmented reality. This includes understanding the difference between AR and other related technologies (like VR), the various types of AR systems, and the underlying technologies that make AR possible.
- Technical Proficiency in AR Development: To equip students with the technical skills necessary to develop AR applications. This often involves learning programming languages (e.g., C#, C++, Java, Swift), working with AR development platforms (e.g., Unity, ARKit, ARCore), and understanding the intricacies of AR software development.
- **Design and User Experience (UX) for AR:** To teach students how to design effective and engaging user experiences for AR applications. This includes understanding human-computer interaction principles in the context of AR, designing intuitive interfaces, and considering the unique challenges and opportunities presented by AR technology.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

- a1. **AR Concepts & Principles:** Articulate the core concepts, principles, and history of augmented reality, differentiating it from related technologies like virtual reality and mixed reality.
- a2. **AR Hardware & Software:** Describe the range of AR hardware (e.g., headmounted displays, mobile devices, depth cameras) and software tools (e.g., SDKs, game engines, computer vision libraries) used in AR development.
- a3. **AR Development Platforms:** Explain the architecture and functionalities of popular AR development platforms (e.g., Unity with ARKit/ARCore, Unreal Engine).
- a4. **AR Interaction Design:** Understand principles of human-computer interaction (HCI) as they apply to AR experiences, including user interface design, interaction techniques, and usability considerations.
- a5. **AR Applications:** Describe the diverse range of applications for AR across various industries, including gaming, education, healthcare, manufacturing, and retail.
- a6. Ethical & Societal Implications: Discuss the ethical and societal implications of AR technology, including issues of privacy, accessibility, and potential impact on society.

a. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **AR Application Development:** Develop AR applications for various platforms (e.g., mobile, wearable) using appropriate programming languages (e.g., C#, C++, Java, Swift) and AR development tools (e.g., Unity, ARKit, ARCore).
- b2. **3D Modeling & Content Creation:** Create and manipulate 3D models and other digital assets for use in AR experiences.
- b3. **Computer Vision for AR:** Implement basic computer vision algorithms for object recognition, tracking, and scene understanding in AR applications. (This might be more advanced depending on the course)
- b4. **AR Interface Design:** Design and implement user interfaces for AR applications that are intuitive, engaging, and effective.
- b5. **User Experience (UX) Evaluation:** Conduct basic user testing and evaluation of AR experiences to assess usability and effectiveness.
- b6. **Problem-Solving & Debugging:** Troubleshoot and debug AR applications, addressing technical challenges and user experience issues.

b. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

c1. **Real-World AR Projects:** Apply AR development skills to create AR applications that address real-world problems or meet specific needs.

- c2. **Project Management:** Manage small-scale AR development projects, including planning, execution, and documentation.
- c3. **Communication & Collaboration:** Effectively communicate technical concepts related to AR development and collaborate with others on AR projects.
- c4. **Critical Thinking & Evaluation:** Evaluate the strengths and weaknesses of different AR technologies and approaches.

c. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. **Critical Evaluation:** Students learn to evaluate AR technologies, designs, and applications critically, considering factors like usability, effectiveness, and potential limitations.
- d2. **Technical Communication:** Students learn to communicate complex technical concepts related to AR clearly and concisely, both in writing and verbally.
- d3. **Visual Communication:** AR is inherently visual. Students develop skills in effectively communicating ideas and designs through visual presentations, prototypes, and demonstrations.
- d4. **Organization & Documentation:** Students learn the importance of organized code, documentation, and project management practices.

3. Contents

No	Topic tought	No. o	f hours	ILOs
INO	Topic taught	Lecture	Tut/Prac	ILOS
1	In this course we examine In- depth study of different AR system architectures, including hardware components (displays, sensors, processors), software frameworks, and networking considerations.	20	_	a1-a4, b1-b3, b5, c1-c5, d1-d4
2	Computer Vision for AR: Advanced computer vision topics relevant to AR, such as object detection and tracking, image processing, feature extraction, and machine learning for AR applications.	24	_	a1-a4, b1-b3, b5, c1-c5, d1-d4
3	Mobile AR: Focus on the challenges and opportunities of developing AR applications for mobile devices. Performance optimization, power management, and user experience considerations.	12	_	a1-a4, b1-b5, c1-c4, d1-d4

4. Teaching and Learning Methods

4a. Lectures

- **4b.** Tutorial Exercises
- **4c.** Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual
	professional and general skills.
Projects	To measure professional and general skills

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- **6a.** Course Notes
 - Short course notes available at the course homepage.
- 6b. Required Books (Textbooks)
 - **"Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer:** This book provides a good overview of the core concepts and technologies behind AR. It might be a good starting point or reference.
- 6c. Recommended Books
 - "Computer Graphics: Principles and Practice" by James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes: A classic text on computer graphics, essential for understanding the rendering and 3D modeling aspects of AR.

6d. Web Sites

 Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>

- 7. Facilities Required for Teaching and Learning
- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled Fathy Hussen

Date: 01/8/2024

Course Matrix

Course Name Augmented Reality Systems

Course Code MM701

			ILOs					Teac		g and Ietho		Assessment Tools			
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d′s	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
-Foundational Understanding of AR: To provide students with a solid understanding of the core concepts, principles, and history of augmented reality.	hardware components (displays, sensors, processors), software frameworks, and networking considerations.	1-10	1-4	1-3, 5	1-5	1-4	~	~						\checkmark	
This includes understanding the difference between AR and other related technologies (like VR), the various types of AR systems, and the	Advanced computer vision topics relevant to AR, such as object detection and tracking, image processing, feature extraction, and machine	11-22	1-4	1-3, 5	1-5	1-4	~	~	~			\checkmark		\checkmark	

underlying technologies that make AR possible. -Technical Proficiency in AR Development: To equip students with the technical skills necessary to develop AR applications. This often involves learning programming languages (e.g., C#, C++, Java, Swift), working with AR development platforms (e.g., Unity, ARKit, ARCore), and understanding the	Mobile AR: Focus on the challenges and opportunities of developing AR applications for mobile devices. Performance optimization, power management, and user experience considerations.	23-28	1-4	1-5	1-4	1-4	~	~		V		✓	
understanding the intricacies of AR													
software development.													

Course Coordinator	Department Head	Prof. Khaled Fathy Hassan
Signature	Signature	Khaled fither Housen

Rendering Techniques Rendering Techniques MM702 MM702



Assiut University Faculty of Computers & Information Quality Assurance Unit

Course Specifications



Relevant program	Master in Computers and
	Information (Multimedia)
Department offers the program	Multimedia
Department offers the course	Multimedia
Academic year	1st Year
Date of specification approval	01/8/2024

A. Basic Information

- 1. **Course Title:** Rendering Techniques
- 2. Course Code:MM702
- 3. Course hours per week:

Lec	ture	Tutorial / Practical	Total
	2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- Provide a deep theoretical and practical understanding of rendering principles and algorithms.
- Develop the skills to analyze, implement, and *extend* existing rendering techniques.
- Prepare students for research and innovation in computer graphics and related fields. The emphasis is on contributing *new* knowledge and pushing the boundaries of the field.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

- a1. **Advanced Rendering Principles:** Demonstrate a comprehensive and in-depth understanding of the theoretical foundations of rendering, including advanced topics in visual perception, light transport, and computational geometry.
- a2. **Rendering Algorithms & Techniques:** Possess expert-level knowledge of a wide range of rendering algorithms and techniques, including global illumination, real-time rendering, non-photorealistic rendering, image-based rendering, and volume rendering. Be able to analyze and compare their strengths, weaknesses, and applicability.
- a3. **Current Research in Rendering:** Demonstrate a thorough understanding of the current state-of-the-art research in rendering, including emerging trends and open problems. Be able to critically evaluate and synthesize existing research.
- a4. **Rendering Hardware & Software:** Understand the architecture and capabilities of modern graphics hardware (GPUs) and be familiar with relevant rendering software tools and APIs.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. Algorithm Implementation & Development: Implement and optimize rendering algorithms using appropriate programming languages (C++, GLSL) and graphics APIs (OpenGL, DirectX, Vulkan). Develop and implement novel rendering techniques or improvements to existing methods.
- b2. **Mathematical & Computational Skills:** Apply advanced mathematical and computational techniques to analyze and solve rendering problems. This includes linear algebra, calculus, numerical methods, and optimization.
- b3. **Research Design & Execution:** Design and execute original research projects in rendering, including formulating research questions, developing hypotheses, conducting experiments, and analyzing results.
- b4. **Critical Analysis & Evaluation:** Critically analyze and evaluate rendering algorithms and techniques, identifying their limitations and potential areas for improvement.

b5. **Problem-Solving & Innovation:** Solve complex rendering problems creatively and develop innovative solutions to challenging research questions.

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. **Original Research Contribution:** Make an original and significant contribution to the field of rendering through research, demonstrated by publications in peer-reviewed journals and conferences.
- c2. **Dissemination of Research:** Effectively communicate research findings through written publications, conference presentations, and other scholarly venues.
- c3. **Collaboration & Communication:** Collaborate effectively with other researchers and professionals in the field, and communicate complex technical concepts clearly and concisely.
- c4. **Professional Development:** Prepare for careers in academia, research and development, or other related fields that require advanced expertise in rendering techniques.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. **Analytical Rigor:** Rendering research often involves tackling highly complex computational and mathematical problems. Students develop exceptional analytical skills to break down these problems, identify key challenges, and devise effective solutions
- d2. Literature Review & Synthesis: Students become adept at conducting comprehensive literature reviews, synthesizing information from diverse sources, and identifying key trends and gaps in the field.
- d3. **Oral Presentations:** Presenting research at conferences and to colleagues is a key part of a PhD. Students develop strong oral communication skills to clearly and persuasively explain complex technical concepts.
- d4. **Organization & Documentation:** Students learn the importance of organized code, meticulous documentation, and effective project management practices.

3. Contents

N	No Topic taught		No. o	f hours	ILOs				
Topic taught		Lecture	Tut/Prac	ILOS					
1		Visual Perception & Psychophysics:	16	_	a1-a5, b1-b7, c1-c4, d1-				
		In-depth study of how human			d3				
		perception influences rendering.							

	Topics include color perception, depth perception, perceptual artifacts, and how these factors impact the design of effective rendering algorithms.			
2	Global Illumination: Detailed exploration of global illumination algorithms	20	_	a1-a5, b1-b7, c1-c5, d1- d4
3	0		_	a1-a5, b1-b7, c1-c4, c6, d1-d4

4. Teaching and Learning Methods

- 4a. Lectures
- **4b.** Tutorial Exercises
- **4c.** Workshops
- 4d. Projects
- 5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual
	professional and general skills.
Projects	To measure professional and general skills

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

6a. Course Notes

- Short course notes available at the course homepage.
- 6b. Required Books (Textbooks)
 - "Computer Graphics: Principles and Practice" by James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes: This is a classic text on computer graphics, providing a solid foundation for understanding the principles behind rendering. It's often used as a reference.
- **6c.** Recommended Books
 - "Physically Based Rendering: From Theory to Implementation" by Matt Pharr, Wenzel Jakob, and Greg Humphreys: A comprehensive guide to physically based rendering, covering the theory and implementation of PBR techniques.

6d. Web Sites

- Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>
- 7. Facilities Required for Teaching and Learning
- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled Fathy Hossian

Date: 01/8/2024

Course Matrix

Course Name Rendering Techniques

Course Code MM702

			ILOs				Teaching and Learning Methods						5	Assessment Tools	
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d′s	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
understanding of rendering	Psychophysics: In-depth study of how human perception influences	1-8	1-5	1-7	1-4	1-3	~	~						\checkmark	
analyze, implement, and extend existing rendering techniques.Prepare students for	Detailed exploration of global illumination	9-18	1-5	1-7	1-5	1-4	~	~	~			~		\checkmark	

research and innovation in	0											
computer graphics and	0 0											
related fields. The emphasis	machine learning to											
is on contributing new	improve rendering	19-28	1-5	1-7	1-4,6	1 /	\checkmark	\checkmark		1		
knowledge and pushing the	algorithms, accelerate	19-20	1-5	1-7	1-4,0	1-4				•	,	
boundaries of the field.	rendering processes, and											
	create new rendering											
	techniques.											

|--|

Signature

Department Head | Prof. Khaled Fathy Hassan

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Advanced Multimedia Communication Advanced Multimedia Communication MM703 MM703



Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Master in Computers and				
	Information (Multimedia)				
Department offers the program	Multimedia				
Department offers the course	Multimedia				
Academic year	1st Year				
Date of specification approval	01/8/2024				

A. Basic Information

- 1. Course Title: Advanced Multimedia Communication
- 2. Course Code:MM703
- 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- Provide a deep theoretical and practical understanding of multimedia communication principles and technologies.
- Develop the skills to analyze, implement, and *extend* existing techniques.
- Prepare students for research and innovation in multimedia communication and related fields. The emphasis is on contributing *new* knowledge and pushing the boundaries of the field.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

a1. Advanced Multimedia Networking: Demonstrate a comprehensive and in-depth understanding of advanced networking concepts relevant to multimedia communication, including QoS, congestion control, routing protocols, and network architectures.

- a2. **Multimedia Content Delivery:** Possess expert-level knowledge of content delivery networks (CDNs), adaptive streaming techniques, caching strategies, and other mechanisms for efficient and scalable multimedia distribution.
- a3. **Quality of Experience (QoE):** Demonstrate a thorough understanding of QoE models, metrics, and management techniques, including subjective and objective quality assessment methods.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **Protocol Design & Analysis:** Design, analyze, and evaluate new or improved multimedia communication protocols, considering factors such as efficiency, reliability, scalability, and security.
- b2. **System Implementation & Evaluation:** Implement and evaluate multimedia communication systems and applications using appropriate programming languages, network simulators, and testbeds.
- b3. **Performance Analysis & Optimization:** Analyze the performance of multimedia communication systems and networks, identify bottlenecks, and develop optimization strategies.
- b4. **Research Design & Execution:** Design and execute original research projects in multimedia communication, including formulating research questions, developing hypotheses, conducting experiments, and analyzing results.
- b5. **Critical Analysis & Evaluation:** Critically analyze and evaluate existing multimedia communication techniques, identifying their limitations and potential areas for improvement.
- b6. **Problem-Solving & Innovation:** Solve complex multimedia communication problems creatively and develop innovative solutions to challenging research questions.

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. **Original Research Contribution:** Make an original and significant contribution to the field of multimedia communication through research, demonstrated by publications in peer-reviewed journals and conferences.
- c2. **Dissemination of Research:** Effectively communicate research findings through written publications, conference presentations, and other scholarly venues.
- c3. **Collaboration & Communication:** Collaborate effectively with other researchers and professionals in the field, and communicate complex technical concepts clearly and concisely.
- c4. **Professional Development:** Prepare for careers in academia, research and development, or other related fields that require advanced expertise in multimedia communication.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. **Analytical Rigor:** Multimedia communication research often involves complex technical challenges related to network performance, quality of service, and system design. Students develop exceptional analytical skills to break down these problems, identify key bottlenecks, and devise effective solutions.
- d2. Data Analysis & Interpretation: Multimedia communication research often involves large datasets (network traffic data, user feedback, performance logs). Students develop skills in analyzing and interpreting this data to draw meaningful conclusions.
- d3. **Collaboration & Teamwork:** Research is often a collaborative effort. Students learn to work effectively in teams, share knowledge, and contribute to group projects.
- d4. **Self-Directed Learning:** PhD research often requires independent learning and exploration. Students develop strong self-learning skills to find and evaluate information from various sources.

3. Contents

No	No Topic taught		f hours		ILOs		
INO			Tut/Prac		ILOS		
1	QoS and QoE: In-depth study of Quality of Service (QoS) and Quality of Experience (QoE) in multimedia networks. Topics include QoS models, metrics, and management techniques. Subjective and objective QoE assessment	30	_	a1-a4, d1-d4	b1-b5,	c1-c5,	
2	Adaptive Streaming: Advanced adaptive streaming techniques, including rate adaptation algorithms, buffer management, and content negotiation. Dynamic adaptation to network conditions and device capabilities.	26	_	a1-a4, d1-d4	b1-b3,	c1-c3,	

4. Teaching and Learning Methods

- **4a.** Lectures
- **4b.** Tutorial Exercises
- 4c. Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual
	professional and general skills.
Projects	To measure professional and general skills.

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- 6a. Course Notes
 - Short course notes available at the course homepage.
- **6b.** Required Books (Textbooks)
 - "Computer Networking: A Top-Down Approach" by Kurose and Ross: While a general networking text, it's a good reference for fundamental networking concepts that underpin multimedia communication.
- 6c. Recommended Books
 - "Multimedia Networking: Technology, Protocols, and Applications" by Halsall and Kareem: This book provides a decent overview of multimedia networking principles, but might not be completely up-todate with the latest research.

6d. Web Sites

 Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>

7. Facilities Required for Teaching and Learning

- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled fathy House

Date: 01/8/2024

Course Matrix

	Course NameAdvanced Multimedia CommunicationCourse				ode MM703	
5	Course Conter	1t l	Teaching WeeksILOsTeaching and Lea Methods		arning As	

			a's	b's	c's	d′s	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	
rinciples ent, and niques.	study of Quality of Service (QoS) and Quality of Experience (QoE) in multimedia networks. Topics include QoS models, metrics, and management	1-15	1-4	1-5	1-5	1-4	~	~						
students and ltimedia l related sis is on new pushing ne field.	Adaptive Streaming: Advanced adaptive streaming techniques, including rate adaptation algorithms, buffer management, and content	16-28	1-4	1-3	1-3	1-4	~	~						

Course Coordinator	1	Prof. Khaled Fathy Hindled fathy Hoston
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Digital Libraries Digital Libraries MM704 MM704



Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Master in Computers and
	Information (Multimedia)
Department offers the program	Multimedia
Department offers the course	Multimedia
Academic year	1st Year
Date of specification approval	1/8/2024

A. Basic Information

- 1. Course Title: Digital Libraries
- 2. Course Code:MM704
- 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- Provide a deep theoretical and practical understanding of digital library principles, technologies, and practices.
- Develop the skills to analyze, design, implement, and *extend* digital library systems.
- Prepare students for research and innovation in digital libraries and related fields. The emphasis is on contributing *new* knowledge and shaping the future of digital information access.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

a1. **Digital Library Theories & Models:** Demonstrate a comprehensive and indepth understanding of the theoretical frameworks, models, and principles that underpin digital libraries, including information seeking behavior, knowledge organization, and digital curation.

- a2. **Digital Library Technologies & Architectures:** Possess expert-level knowledge of a wide range of technologies and architectures used in digital libraries, including information storage and retrieval, knowledge organization systems, and digital preservation tools.
- a3. **Social, Ethical, & Legal Issues:** Demonstrate a thorough understanding of the social, ethical, and legal implications of digital libraries, including access, equity, privacy, intellectual property, and copyright.
- a4. **Current Research in Digital Libraries:** Demonstrate a thorough understanding of the current state-of-the-art research in digital libraries, including emerging trends, open problems, and innovative approaches.

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **Research Design & Execution:** Design and execute original research projects in digital libraries, including formulating research questions, developing hypotheses, conducting experiments or analyses, and interpreting results.
- b2. **System Design & Implementation:** Design and implement components of digital library systems, including information retrieval modules, metadata schemas, or user interfaces.
- b3. **Data Analysis & Interpretation:** Analyze and interpret data related to digital library usage, user behavior, and system performance using appropriate statistical and qualitative methods.
- b4. **Critical Analysis & Evaluation:** Critically analyze and evaluate existing digital library systems, identifying their strengths, weaknesses, and potential areas for improvement.
- b5. **Problem-Solving & Innovation:** Solve complex digital library problems creatively and develop innovative solutions to challenging research questions.

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. **Original Research Contribution:** Make an original and significant contribution to the field of digital libraries through research, demonstrated by publications in peer-reviewed journals and conferences.
- c2. **Dissemination of Research:** Effectively communicate research findings through written publications, conference presentations, and other scholarly venues.
- c3. **Collaboration & Communication:** Collaborate effectively with other researchers and professionals in the field, and communicate complex technical concepts clearly and concisely.
- c4. **Professional Development:** Prepare for careers in academia, research and development, or other related fields that require advanced expertise in digital libraries.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. Communicate efficiently by different means.
- d2. Use the information technology to develop the professional practice.
- d3. Use different recourses to obtain information and knowledge.
- d4. Effectively make ideas, designs and solutions in a logical framework in a variety of forms with proper language structure and mechanics, and to produce appropriate written documentation.

3. Contents

No	Topic tought	No. o	f hours		ILOs	
INO	Topic taught	Lecture	Tut/Prac		ILOS	
1	Information Seeking Behavior (Multimedia Context): How users search for, access, and interact with multimedia content in digital libraries. Considering different modalities (visual, auditory, textual) and search strategies.	10	_	a1-a4, d1-d4	b1-b5, c1-c	5,
2	Knowledge Organization for Multimedia: Metadata schemas, ontologies, and classification systems specifically designed for describing and organizing multimedia resources. Challenges of semantic description of visual and auditory content.	20	_	a1-a4, d1-d4	b1-b5, c1-c	5,
3	Digital Curation & Preservation of Multimedia: Advanced techniques for the long-term management, preservation, and access to multimedia objects. Format migration, codec support, and digital asset management for diverse media types.	26	_	a1-a4, d1-d4	b1-b5, c1-c	5,

4. Teaching and Learning Methods

- **4a.** Lectures
- **4b.** Tutorial Exercises
- 4c. Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual professional and general skills.
Projects	To measure professional and general skills.

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- **6a.** Course Notes
 - Short course notes available at the course homepage.
- **6b.** Required Books (Textbooks)
 - **"Digital Libraries: A Practical Approach" by Arms:** A good starting point for understanding core digital library concepts, though it may not be fully up-to-date.
- **6c.** Recommended Books
 - **"The Elements of Library and Information Science" by Robert and Deborah Sager:** A broader text that covers library and information science principles, which are relevant to digital libraries.

6d. Web Sites

 Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>

7. Facilities Required for Teaching and Learning

- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled fathy Hussen

Date: 1/8/2024

Course Matrix

Course Name | Digital Libraries

Course Code MM704

				IL	Os]	Feac		and etho		rning	5	Assessment Tools	
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d's	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
• Develop the skills to analyze, design, implement, and extend digital library systems.	Behavior (Multimedia Context): How users search for, access, and interact with multimedia content in	1-5	1-4	1-5	1-5	1-4	~	~						√	

research and innovation in digital libraries and related fields. The emphasis is on contributing new knowledge and shaping the future of digital information access.	Organization for Multimedia: Metadata schemas, ontologies, and classification systems	6-15	1-4	1-5	1-5	1-4	~	~			\checkmark	
	Digital Curation & Preservation of Multimedia: Advanced techniques for the long- term management, preservation, and access to multimedia objects. Format migration, codec support, and digital asset management for diverse media types.	16-28	1-4	1-5	1-5	1-4	~	~		~	V	

Course Coordinator	Department Head	Prof. Khaled Fathy Hasssan
Signature	Signature	Khaled Fathy House

Advanced Topics in Multimedia Advanced Topics in Multimedia MM705 MM705



Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Master in Computers and					
	Information (Multimedia)					
Department offers the program	Multimedia					
Department offers the course	Multimedia					
Academic year	1st Year					
Date of specification approval	01/8/2024					

A. Basic Information

- 1. **Course Title:** Advanced Topics in Multimedia
- 2. Course Code:MM705
- 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- Provide students with deep expertise in specific areas of multimedia.
- Equip students with the research skills necessary to contribute original knowledge to the field.
- Foster innovation and creativity in the development of new multimedia technologies and applications.
- Prepare students for leadership roles in research, development, and education.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

a1. **Deep Understanding of AI for Multimedia:** Demonstrate a comprehensive and in-depth understanding of advanced AI and machine learning techniques relevant to multimedia analysis, including deep learning, computer vision, natural language processing, and multimodal fusion. *(Measurable through examinations, literature reviews, and research proposals)*

- a2. **Specific Multimedia Analysis Domain Expertise:** Possess expert-level knowledge of a specific area within AI for multimedia analysis, such as video understanding, image captioning, audio analysis, or multimodal content retrieval. (*Measurable through specialized assignments, project work, and dissertation*)
- a3. **Current Research Landscape:** Demonstrate a thorough understanding of the current state-of-the-art research in the chosen specialization, including emerging trends, open problems, and competing approaches. (*Measurable through literature reviews, conference presentations, and dissertation*)

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **AI Model Development & Implementation:** Develop and implement advanced AI and machine learning models for multimedia analysis using appropriate programming languages (Python, etc.) and deep learning frameworks (TensorFlow, PyTorch). (*Measurable through project work, code repositories, and dissertation*)
- b2. **Data Analysis & Interpretation:** Analyze and interpret large multimedia datasets using appropriate statistical and machine learning techniques. Critically evaluate the performance and limitations of AI models. (*Measurable through project reports, publications, and dissertation*)
- b3. **Research Design & Execution:** Design and execute original research projects in the chosen area of AI for multimedia analysis, including formulating research questions, developing hypotheses, conducting experiments, and analyzing results. (*Measurable through research proposals, publications, and dissertation*)
- b4. **Critical Analysis & Evaluation:** Critically analyze and evaluate existing AIbased multimedia analysis techniques, identifying their limitations and potential areas for improvement. (*Measurable through literature reviews, project reports, and dissertation*)
- b5. **Problem-Solving & Innovation:** Solve complex multimedia analysis problems creatively and develop innovative solutions to challenging research questions. (*Measurable through research contributions, publications, and patents (if applicable)*)

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. Master basic and modern professional skills in Computer Science.
- c2. Use technological tools to serve the professional practice.
- c3. Developefficient strategies for complex data-structuring problems and design fast algorithms for a variety of applications.
- c4. Propose and design possible alternative directions for further work.
- c5. Analyze, evaluate and synthesize research and apply theoretical ideas to practical settings.

d. General and Transferable Skills

On successful completion of this program, graduates should be able to:

- d1. **Original Research Contribution:** Make an original and significant contribution to the chosen area of AI for multimedia analysis through research, demonstrated by publications in peer-reviewed journals and conferences. (*Measurable through publications and dissertation*)
- d2. **Dissemination of Research:** Effectively communicate research findings through written publications, conference presentations, and other scholarly venues. (*Measurable through publications, conference presentations, and thesis defense*)
- d3. **Collaboration & Communication:** Collaborate effectively with other researchers and professionals in the field, and communicate complex technical concepts clearly and concisely. (*Measurable through collaborative projects, co-authored publications, and letters of recommendation*)
- d4. **Professional Development:** Prepare for careers in academia, research and development, or other related fields that require advanced expertise in AI for multimedia analysis. (*Measurable through career placement, post-doctoral fellowships, and grant awards (if applicable)*)

3. Contents

No	Topic tought	No. o	f hours	ILOs			
INO	Topic taught	Lecture	Tut/Prac	ILOS			
1	Deep Learning for Multimedia: Advanced architectures (CNNs, RNNs, Transformers), training techniques, and optimization strategies specific to multimedia data. Multimodal learning and fusion.	18	_	a1-a4, b1-b5, c1-c5, d1-d3			
2	ComputerVisionforMultimedia:Objectdetection,imagesegmentation,actionrecognition, videounderstanding,andothercomputertechniquesappliedtoanalysis.analysis.	20	_	a1-a4, b1-b5, c1-c5, d1-d4			
3	Specific Research Methods: Focus on research methods relevant to the chosen advanced topic, such as experimental design, user studies, performance evaluation, and comparative analysis.	18	_	a1-a4, b1-b5, c1-c5, d1-d4			
4	Evaluation Metrics: Defining and using appropriate evaluation metrics to assess the performance of multimedia analysis systems.	18	_	a1-a4, b1-b3, b5, c1-c3, c5, d1-d4			

4. Teaching and Learning Methods

- **4a.** Lectures
- 4b. Tutorial Exercises
- **4c.** Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual professional and general skills.
Projects	To measure professional and general skills.

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- 6a. Course Notes
 - Short course notes available at the course homepage.
- 6b. Required Books (Textbooks)
 - **Deep Learning (General):** "Deep Learning" by Goodfellow, Bengio, and Courville is a foundational text, but you'll likely need to supplement it with more recent and specialized material.

6c. Recommended Books

• **Computer Vision (General):** "Computer Vision: Algorithms and Applications" by Szeliski is a comprehensive resource, but again, you'll need to look at more recent papers for advanced techniques

6d. Web Sites

- Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>
- 7. Facilities Required for Teaching and Learning
- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled Fatory Hossian

Date: 1/8/2024

Course Matrix

Course Name Advanced Topics in multimedia

Course Code MM705

				IL	Os			Tea		g an ⁄Ieth		arnin	g	Assessment Tools	
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d′s	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
Provide Associate with door	Deep Learning for Multimedia:														
 students with deep expertise in specific areas of multimedia. Equip students with the 	Advanced architectures (CNNs, RNNs, Transformers), training techniques, and optimization strategies specific to multimedia data. Multimodal learning and fusion.	1-9	1-4	1-5	1-5	1-3	~	~						\checkmark	
research skills necessary to contribute original knowledge to the field. • Foster	video understanding, and other computer vision techniques applied to multimedia analysis.	10-19	1-4	1-5	1-5	1-4	~	~						\checkmark	
innovation and creativity in the development of new multimedia technologies and applications.	the chosen advanced topic, such as experimental design, user studies,	20-28	1-4	1-5	1-5	1-4	~	V						\checkmark	

Prepare	Evaluation Metrics: Defining and											
students for	using appropriate evaluation											
leadership roles in	metrics to assess the performance	29-37	1 4	1 2 E	1 2 E	1 /	\checkmark	\checkmark				
research,	of multimedia analysis systems.	29-37	1-4	1-3, 5	1-3, 5	1-4					v	
development, and												
education.												

 Course Coordinator
 Department Head
 Prof. Khaled Fathy Hassan

Signature

Signature Khaled fathy House

Advanced Topics in Human Computer Interaction Advanced Topics in Human Computer Interaction MM706 MM706



Assiut University Faculty of Computers & Information Quality Assurance Unit



Course Specifications

Relevant program	Master in Computers and									
	Information (Multimedia)									
Department offers the program	Multimedia									
Department offers the course	Multimedia									
Academic year	1st Year									
Date of specification approval	1/8/2024									

A. Basic Information

- 1. Course Title: Advanced Topics in Human Computer Interaction
- 2. Course Code:MM706
- 3. Course hours per week:

Lecture	Tutorial / Practical	Total
2	_	2

B. Professional Information

1. Overall aims of the course

Upon completing this course the student will have learned, through appropriate classroom and laboratory experiences, the following.

- Provide students with deep expertise in specific areas of HCI.
- Equip students with the research skills necessary to contribute original knowledge to the field.
- Foster innovation and creativity in the design and evaluation of interactive systems.
- Prepare students for leadership roles in HCI research, development, and education.

2. Intended Learning Outcomes (ILOs) of the course

a. Knowledge and Understanding

On successful completion of the program, graduates should be able to:

a1. **Deep Understanding of Immersive Technologies:** Demonstrate a comprehensive and in-depth understanding of advanced immersive technologies, including virtual reality (VR), augmented reality (AR), mixed reality (MR), haptics, and other sensory interfaces. (*Measurable through examinations, literature reviews, and research proposals*)

- a2. **Human Factors in Immersive Environments:** Possess expert-level knowledge of human perception, cognition, and motor skills as they relate to interaction in immersive environments. Understanding presence, embodiment, and other key concepts. (*Measurable through specialized assignments, project work, and dissertation*)
- a3. **Current Research Landscape in Immersive HCI:** Demonstrate a thorough understanding of the current state-of-the-art research in immersive HCI, including emerging trends, open problems, and competing approaches. (*Measurable through literature reviews, conference presentations, and dissertation*)

b. Intellectual Skills

On successful completion of this program, graduates should be able to:

- b1. **Design & Prototyping for Immersive Experiences:** Design and prototype innovative user interfaces and interaction techniques for immersive environments using appropriate tools and technologies. (*Measurable through project work, code repositories, and dissertation*)
- b2. User Study Design & Execution: Design and conduct rigorous user studies to evaluate the effectiveness, usability, and user experience of immersive systems. This includes selecting appropriate methodologies (qualitative, quantitative, mixed methods), recruiting participants, and analyzing data. (*Measurable through project reports, publications, and dissertation*)
- b3. **Development & Implementation of Immersive Systems:** Develop and implement immersive systems using relevant programming languages, software development kits (SDKs), and hardware platforms. (*Measurable through project work, code repositories, and dissertation*)
- b4. **Critical Analysis & Evaluation of Immersive HCI Research:** Critically analyze and evaluate existing research in immersive HCI, identifying limitations and suggesting future directions. (*Measurable through literature reviews, project reports, and dissertation*)
- b5. **Problem-Solving & Innovation in Immersive HCI:** Solve complex design and implementation challenges in immersive HCI and develop innovative solutions to challenging research questions. (*Measurable through research contributions, publications, and patents (if applicable)*)

c. Professional and Practical Skills

On successful completion of this program, graduates should be able to:

- c1. **Original Research Contribution:** Make an original and significant contribution to the chosen area of immersive HCI through research, demonstrated by publications in peer-reviewed journals and conferences. *(Measurable through publications and dissertation)*
- c2. Dissemination of Research: Effectively communicate research findings through written publications, conference presentations, and other scholarly venues. (*Measurable through publications, conference presentations, and thesis defense*)

- c3. **Collaboration & Communication:** Collaborate effectively with other researchers and professionals in the field, and communicate complex technical concepts clearly and concisely. (*Measurable through collaborative projects, co-authored publications, and letters of recommendation*)
- c4. **Professional Development:** Prepare for careers in academia, research and development, or other related fields that require advanced expertise in immersive HCI. (*Measurable through career placement, post-doctoral fellowships, and grant awards (if applicable)*)

d. General and Transferable Skills

- On successful completion of this program, graduates should be able to:
- d1. Communicate efficiently by different means.
- d2. Use the information technology to develop the professional practice.
- d3. Use different recourses to obtain information and knowledge.
- d4. Effectively make ideas, designs and solutions in a logical framework in a variety of forms with proper language structure and mechanics, and to produce appropriate written documentation.

3. Contents

NIa	Topic toy abt	No. o	f hours	ILOs					
No	Topic taught	Lecture	Tut/Prac		ILOS				
1	Human Perception & Cognition	18		a1-a4,	b1-b3,	c1-c5,			
	in Immersive Contexts: Deep			d1-d3					
	dive into how human perception								
	(visual, auditory, haptic) and		—						
	cognitive processes are affected								
	by immersive environments.								
	Presence, embodiment, and other								
	relevant psychological concepts.								
2	Multimodal Interaction Design:	16			b1-b4,	c1-c5,			
	Principles and techniques for			d1-d3					
	designing interactions that								
	leverage multiple input								
	modalities (e.g., speech, gesture,		—						
	touch, gaze) in immersive								
	settings. Multimodal fusion and								
	user interface design for								
	multimodal systems.								
3	User-Centered Design for	24		-	b1-b4,	c1-c5,			
	Immersive Experiences:			d1-d4					
	Adapting user-centered design								
	methodologies to the unique		_						
	challenges of designing for VR,		_						
	AR, and other immersive								
	technologies. Focus on user								
	needs, accessibility, and ethical								
	considerations								

4. Teaching and Learning Methods

4a. Lectures

- **4b.** Tutorial Exercises
- 4c. Workshops
- 4d. Projects

5. Student Assessment

5a. Tools

Final Exam	To measure knowledge, understanding, intellectual professional and general skills.
Projects	To measure professional and general skills.

5b. Time Schedule

Assessment	Week No
Final Exam	30

5c. Grading System

Assessment	Grade %
Final Exam	70%
Year Work	30%

5d. Formative Assessment

Regular quizzes distributed along the whole semester.

6. List of References

- **6a.** Course Notes
 - Short course notes available at the course homepage.
- **6b.** Required Books (Textbooks)
 - **"The Design of Everyday Things" by Don Norman:** A classic text on usability and user-centered design, still relevant for fundamental interaction principles.

6c. Recommended Books

 "Human-Computer Interaction" by Alan Dix, Janet Finlay, Gregory D.
 Abowd, and Russell Beale: A comprehensive overview of HCI principles and techniques, useful as a general reference.

6d. Web Sites

 Course homepage is accessed from the FCI website: <u>http://www.aun.edu.eg/Courses/</u>

- 7. Facilities Required for Teaching and Learning
- A lecture hall equipped with projectors and computers.
- Labs equipped with computers and Internet facilities.
- A library.

Course Coordinator:

Signature:

Date:

Department Head: Prof. Khaled Fathy Hassan

Signature: Khaled fathy Hussen

Date: 01/8/2024

Course Matrix

Course NameAdvanced Topics in Human ComputerCourse CodeMM706Interaction

				ILOs						g and Ietho		Assessment Tools			
Course Aims	Course Content	Teaching Weeks	a's	b's	c's	d's	Lectures	Tutorial Exercises	Practical Exercises	Workshops	Projects	Case Study	Data Collections	Final Exam	Criteria
 Provide students with deep expertise in specific areas of HCI. Equip students with the research skills necessary to contribute original knowledge to the field. Foster innovation and creativity in the 	Human Perception & Cognition in Immersive Contexts: Deep dive into how human perception (visual, auditory, haptic) and cognitive processes are affected by immersive environments. Presence, embodiment, and other relevant psychological concepts.	1-9	1-4	1-3	1-5	1-3	v	~						V	

 design and evaluation of interactive systems. Prepare students for leadership roles in HCI research, development, and education. 	Multimodal Interaction Design: Principles and techniques for designing interactions that leverage multiple input modalities (e.g., speech, gesture, touch, gaze) in immersive settings. Multimodal fusion and user interface design for multimodal systems.	10-17	1-4	1-4	1-5	1-3	V	~			\checkmark	
	User-Centered Design for Immersive Experiences: Adapting user-centered design methodologies to the unique challenges of designing for VR, AR, and other immersive technologies. Focus on user needs, accessibility, and ethical considerations	18-29	1-4	1-4	1-5	1-4	~	~			\checkmark	

Course Coordinator	Department Head	Prof. Khaled Fathy Hassan
Signature	Signature	Khaled Fathy Hussian