Sana'a University
Faculty of Engineering
Department: Electrical Engineering
Title of the Program: Communication Engineering and Networks

Course Specification of Multimedia Communication

I. Course Identification and General Information:

1.	Course Title:	Multimedia Communication				
2.	Course Code & Number:	CNE333				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	2	-	-	3
4.	Study level/ semester at which this course is offered:	Fourth Year/ Second Semester				
5.	Pre –requisite (if any):	None				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Communication Engineering and Networks				
8.	Language of teaching the course:	English				
9.	Location of teaching the course:	Classes at the Faculty of Engineering				
10.	Prepared By:	Asst. Prof. Dr. Nasser H. Almofari				
11.	Date of Approval					

II. Course Description:

This course introduces technologies for multimedia coding, processing and communications. it will address how to efficiently represent multimedia data and how to deliver them over a variety of networks. Coding and compression technologies for different multimedia types is presented including JPEG, ITU G722 coder, MPEG-1, MPEG-2, MPEG4, H.26x, MPEG7, MPEG21 and VLC. Sending multimedia over the internet and wireless networks also covered with considering the synchronization and the QoS aspects.

Prepared by	Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance
Asst. Prof. Dr. Nasser Almofari	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1	Demonstrate the knowledge and understanding of the multimedia communications systems, application and basic principles	A1
a2	Define the required networks for multimedia communication	A1
b1	Solve the engineering problems related to multimedia communication	B1
b2	Categorize the different compression standards	B2
c1	Solve the engineering problems related to multimedia communications using the knowledge of basic multimedia concepts.	C1
c2	Develop innovative coding and compression components to meet the required specifications of multimedia services	C2
d1	Acquire the ability to work within a team	D1

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Demonstrate the knowledge and understanding of the multimedia communications systems, application and basic principles	▪ Active lectures ▪ Interactive class ▪ Discussions ▪ Exercises and home ▪ Works	▪ Midterm and final written tests. ▪ Homework and assignments reports
a2- Define the required networks for multimedia communication	▪ Active lectures ▪ Interactive class ▪ Discussions ▪ Exercises and home ▪ Works	▪ Midterm and final written tests. ▪ Homework and assignments reports

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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:			
Course Intended Learning Outcomes		Teaching strategies	Assessment Strategies
b1-	Solve the engineering problems related to multimedia communication	▪ Active lectures ▪ Tutorials ▪ Interactive class ▪ Discussions ▪ Exercises and home ▪ Works	▪ Midterm and final written tests. ▪ Homework and assignments reports ▪
b2-	Categorize the different compression standards	▪ Active lectures ▪ Tutorials ▪ Interactive class ▪ Discussions ▪ Exercises and home ▪ Works	▪ Midterm and final written tests. ▪ Homework and assignments reports ▪

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:			
Course Intended Learning Outcomes		Teaching strategies	Assessment Strategies
c1-	Solve the engineering problems related to multimedia communications using the knowledge of basic multimedia concepts.	▪ Active lectures ▪ Tutorials ▪ Interactive class ▪ Discussions ▪ Exercises and home ▪ Works	▪ Midterm and final written tests. ▪ Homework and assignments reports
c2-	Develop innovative coding and compression components to meet the required specifications of multimedia services	▪ Active lectures ▪ Tutorials ▪ Interactive class ▪ Discussions	▪ Midterm and final written tests. ▪ Homework and assignments reports

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	▪ Exercises and home ▪ Works	

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Acquire the ability to work within a team	▪ Team work ▪ Presentations ▪ Exercises and home ▪ Works (in groups)	▪ Homework and assignments reports

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction to Multimedia and its applications	a1, a2	▪ Course orientation ▪ Communication systems review ▪ Multimedia applications	1	2
2.	Fundamentals of multimedia	a1, a2	▪ Multimedia information ▪ Representation ▪ Multimedia service in the real time. Classification of the multimedia services. ▪ Digitalization principles. ▪ Multimedia Content, Text, images, audio and video	2	4
3.	Text and image Compression	a1, a2, b2,d1	▪ Compression Principles,	2	4

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			▪ Entropy and Source Encoding, Huffman Coding ▪ Fundamentals of Image, Redundancy in Image, ▪ Lossless and Lossy image Compression Techniques, ▪ Measurements quality of Reconstructed Image (MSE, SNR, PSNR), Huffman Coding, GIF, TIFF, JPEG		
4.	Speech and audio Coding standards	a1, a2, b1, b2, c1, c2, d1	▪ Speech analysis, syntheses and prediction, Long term Prediction (LTP) ▪ ITU G722 coder ▪ MPEG-1, MPEG-2, MPEG4 ▪ Other audio coding standards	2	4
5.	Video Coding and Compression	a1, a2, b1, b2, c1, c2, d1	▪ Video compression principles ▪ Video compression standards, H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and ▪ Reversible VLCs, MPEG 7 standardization process of multimedia content description, ▪ MPEG 21 multimedia framework	2.5	5
6.	Multimedia across Communications Networks.	a1, a2, b1, c1,d1	▪ Multimedia Across Wireless networks, Speech transmission in GSM, Video across GSM, ATM, IP. SIP in mobile environment, Digital video broadcasting:	2.5	5

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			▪ Data transmission using MPEG-2 and DVB, ▪ Broadband Multimedia Satellite ▪ Systems: Digital television infrastructure for interactive multimedia Services		
7.	Multimedia Synchronization and QoS	a1, a2, b1, c1, d1	▪ Basic synchronization concepts and methods ▪ QoS: model, description, parameters, negotiation, QoS Negotiation in the ST-II protocol ▪ QoS and IP: Integrated Services (IntServ), Resource Reservation Protocol (RSVP), Differentiated Services (DiffServ).	2	4
Number of Weeks /and Units Per Semester				**14**	**28**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Introduction to Multimedia and its applications	1	2	a1, a2
2.	Fundamentals of multimedia	2	4	a1, a2
3.	Text and image Compression	2	4	a1, a2, b2,d1
4.	Speech and audio Coding standards	2	4	a1, a2, b1, b2, c1, c2, d1
5.	Video Coding and Compression	2.5	5	a1, a2, b1, b2, c1, c2, d1
6.	Multimedia across Communications Networks.	2.5	5	a1, a2, b1, c1,d1

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7.	Multimedia Synchronization and QoS	2	4	a1, a2, b1, c1, d1
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

- Active lectures
- Tutorials
- Interactive class discussions
- Exercises and home works
- Presentations
- Team work

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Identify the different multimedia files types and their usage	a1,d1	4th week	3
2.	Compare different coding and compression standards for text, and audio	a1, b2, c1,c2,d1	7th week	4
3.	Study on different video coding standards	a1, b2, c1,c2,d1	9th week	4
4.	Compare the networks performance and quality of service schemes used for voice and video transmission.	a1,a2, b1,c1,d1	13th week	4
	Total			**15**

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments	All weeks	15	10%	a1,a2, b1, b2, c1,c2 ,d1

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2.	Midterm exam	8th	30	20%	a1, a2, b1, b2, c1, c2
3.	Final Exam	16th	105	70%	a1, a2, b1, b2, c1, c2
	Total		**150**	**100%**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Fred Halsall, 2001, "Multimedia Communications: Techniques, Standards, and Networks", Pearson education.
2. Jerry D. Gibson, 2001, "Multimedia Communications Directions and Innovations", USA, Academic Press.

2- Essential References.

1. Nigel P. Chapman, 2000, "Digital Multimedia", John wiley and Sons LTD
2. Jens Ohm, 2004, Multimedia Communication Technology: Representation, Transmission and Identification of Multimedia Signals, Springer.
3. K.R. Rao, Zoran S. Bojkovic, Bojan M. Bakmaz, 2014, "Wireless Multimedia Communication Systems: Design, Analysis, and Implementation", CRC Press.

3- Electronic Materials and Web Sites *etc*.

1. http://www.wu.ece.ufl.edu/courses/eel6935f04/index.htm
2. https://www.vcodex.com/h264-resources/

IX. Course Policies:

1.	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2.	**Tardy:**

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	For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam-
4.	**Assignments & Projects:** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-
5.	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty-
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc. Prof. Dr.**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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Sana'a University
Faculty of Engineering
Department: Electrical Engineering
Title of the Program: Communication Engineering and Networks

Course Plan of Multimedia Communication

I. Information about Faculty Member Responsible for the Course:								
Name of Faculty Member	Asst. Prof. Dr. Nasser H. Almofari	**Office Hours**						
Location& Telephone No.	Sana'a City 777344970	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	almofaryn@gmail.com						

II. Course Identification and General Information:						
1-	Course Title:	Multimedia Communication				
2-	Course Number & Code:	CNE333				
3-	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	2	-	-	3
4-	Study level/year at which this course is offered:	Fourth Year/ Second Semester				
5-	Pre –requisite (if any):	None				
6-	Co –requisite (if any):	None.				
7-	Program (s) in which the course is offered	Communication Engineering and Networks				
8-	Language of teaching the course:	English				
9-	System of Study:	Semesters				
10-	Mode of delivery:	Weekly lectures and tutorials				
11-	Location of teaching the course:	Classes at the Faculty of Engineering				

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Asst. Prof. Dr. Nasser Almofari	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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III. Course Description:

This course introduces technologies for multimedia coding, processing and communications. it will address how to efficiently represent multimedia data and how to deliver them over a variety of networks. Coding and compression technologies for different multimedia types is presented including JPEG, ITU G722 coder, MPEG-1, MPEG-2, MPEG4, H.26x, MPEG7, MPEG21 and VLC. Sending multimedia over the internet and wireless networks also covered with considering the synchronization and the QoS aspects.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop**:**

1- Demonstrate the knowledge and understanding of the multimedia communications systems, application and basic principles
2- Define the required networks for multimedia communication
3- Solve the engineering problems related to multimedia communication
4- Categorize the different compression standards
5- Solve the engineering problems related to multimedia communications using the knowledge of basic multimedia concepts.
6- Develop innovative coding and compression components to meet the required specifications of multimedia services
7- Acquire the ability to work within a team

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction to Multimedia and its applications	▪ Course orientation ▪ Communication systems review ▪ Multimedia applications	1st	2

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2.	Fundamentals of multimedia	▪ Multimedia information ▪ Representation ▪ Multimedia service in the real time. Classification of the multimedia services. ▪ Digitalization principles. ▪ Multimedia Content, Text, images, audio and video	2nd ,3rd	4
3.	Text and image Compression	▪ Compression Principles, ▪ Entropy and Source Encoding, Huffman Coding ▪ Fundamentals of Image, Redundancy in Image, ▪ Lossless and Lossy image Compression Techniques, ▪ Measurements quality of Reconstructed Image (MSE, SNR, PSNR), Huffman Coding, GIF, TIFF, JPEG	4th ,5th	4
4.	Speech and audio Coding standards	▪ Speech analysis, syntheses and prediction, Long term Prediction (LTP) ▪ ITU G722 coder ▪ MPEG-1, MPEG-2, MPEG4 ▪ Other audio coding standards	6th ,7th	4
5.	Midterm Exam		8th	2
6.	Video Coding and Compression	▪ Video compression principles ▪ Video compression standards, H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and ▪ Reversible VLCs, MPEG 7 standardization process of multimedia content description, ▪ MPEG 21 multimedia framework	9th ,10th ,11th	5

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7.	Multimedia across Communications Networks.	▪ Multimedia Across Wireless networks, Speech transmission in GSM, Video across GSM, ATM, IP. SIP in mobile environment, Digital video broadcasting: ▪ Data transmission using MPEG-2 and DVB, ▪ Broadband Multimedia Satellite ▪ Systems: Digital television infrastructure for interactive multimedia Services	11th ,12th ,13th	5
8.	Multimedia Synchronization and QoS	▪ Basic synchronization concepts and methods ▪ QoS: model, description, parameters, negotiation, QoS Negotiation in the ST-II protocol ▪ QoS and IP: Integrated Services (IntServ), Resource Reservation Protocol (RSVP), Differentiated Services (DiffServ).	14th ,15th	4
9.	Final Exam		16th	3
Number of Weeks /and Units Per Semester			**16**	**33**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours
1.	Introduction to Multimedia and its applications	1st	2
2.	Fundamentals of multimedia	2nd ,3rd	4
3.	Text and image Compression	4th ,5th	4
4.	Speech and audio Coding standards	6th ,7th	4
5.	Video Coding and Compression	8th ,9th ,10th	5
6.	Multimedia across	10th ,11th ,12th	5

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	Communications Networks.		
7.	Multimedia Synchronization and QoS	13th ,14th	4
Number of Weeks /and Units Per Semester		**14**	**28**

VI. Teaching strategies of the course:

- Active lectures
- Tutorials
- Interactive class discussions
- Exercises and home works
- Presentations
- Team work

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Identify the different multimedia files types and their usage	a1,d1	4th week	3
2.	Compare different coding and compression standards for text, and audio	a1, b2, c1,c2,d1	7th week	4
3.	Study on different video coding standards	a1, b2, c1,c2,d1	9th week	4
4.	Compare the networks performance and quality of service schemes used for voice and video transmission.	a1,a2, b1,c1,d1	13th week	4
	Total			**15**

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VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments	All weeks	15	10%	a1,a2, b1, b2, c1,c2 ,d1
2.	Midterm exam	8th	30	20%	a1, a2, b1, b2, c1, c2
3.	Final Exam	16th	105	70%	a1, a2, b1, b2, c1, c2
	Total		**150**	**100%**	

IX. Learning Resources:

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3- Electronic Materials and Web Sites *etc*.

1. http://www.wu.ece.ufl.edu/courses/eel6935f04/index.htm
2. https://www.vcodex.com/h264-resources/

X. Course Policies:

1. Class Attendance:

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