1.	Course Title	Multimedia systems
2.	Code	F18L3S135
3.	Study program	Software engineering and information systems
4.	Study Program Organizer	Faculty of Computer Science and Engineering
5.	Degree (first, second, third cycle)	first cycle
6.	Academic year / semester 3 / summer / mandatory	7. ECTS credits 6
8.	Teacher	assistant professor Biljana Stojkoska
9.	Course enrollment prerequisites	Алгоритми и податочни структури
10.	Course program goals (competencies): Introducing the student with the basic concepts for working with multimedia data, the ways of their modeling and implementation and manipulation of them. The student will be able to model multimedia data, will know how to practically apply the content-based search on multimedia data, and will gain initial knowledge for creating applications based on multimedia content.	
11.	Course program content: Introduction to multimedia and classification of multimedia content. Components of a multimedia system. Multimedia creation (signals, AD conversion, Fourier transform, sampling and quantization, filtering and sub-sampling). Multimedia representation (picture, video, audio). YUV sub-sampling. Theory of colors, trichromacy, physiology of the human visual system, color schemes (RGB, YUV, CMYK, ...). Basics of compression (entropy, taxonomy, metrics). Compression techniques (Hoffman coding, arithmetic coding, LZW, run-length encoding, vector quantization, sub-band coding, differential pulse-code modulation, hybrid schemes ...). Compression challenges (symmetric vs. non-symmetric, adaptive vs. nonadaptive, speed and complexity of the encoder/decoder, ...). Image compression (GIF, PNG, MPEG, MPEG 2000, discrete wavelet transformation, fractal coding, ...). Video compression (temporal redundancy, block-based prediction of frames, motion vector calculation, I frames, B frames, P frames, multi-frame prediction, GOP video structure). Complexity of motion compensation (logarithmic vs. hierarchical search). MPEG standard. Audio compression (delta modulation, logarithmic quantization, ...). QoS and QoE.	
12.	Learning methods: Lectures using presentations, interactive lectures, exercises (using equipment and software packages), teamwork, case studies, invited guest lecturers, independent preparation and defense of a project assignment and seminar work.	
13.	Total available time	6 ECTS x 30 hours = 180 hours

14.	Distribution of the available time		30 + 45 + 15 + 15 + 75 = 180 hours	
15.	Teaching activity forms	15.1.	Lectures – theoretical teaching	30 hours
		15.2.	Exercises (laboratory, auditory), seminar papers, teamwork	45 hours
16.	Other activity forms	16.1.	Project Tasks	15 hours
		16.2.	Independent Learning Tasks	15 hours
		16.3.	Home learning	75 hours

17.	Assessment methodology		
	17.1.	Tests	10 points
	17.2.	Seminar paper/project (presentation: written and oral)	10 points
	17.3.	Activity and learning	10 points
	17.4.	Final exam	70 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)
19.	Course completion and final exam requirements	Realized activities 15.1 and 15.2	
20.	Teaching Language	Macedonian and English	
21.	Teaching quality evaluation method	Internal evaluation mechanisms and questionnaires	

22. Course Material

22.1. Mandatory course material

No.	Author	Title	Publisher	Year
1	Havaldar, Parag, and Gerard Medioni	Multimedia systems: algorithms, standards, and industry practices	Course Technology Press	2009

22.2. Additional course material

No.	Author	Title	Publisher	Year