SYLLABUS

1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty[1] / Department[2]	Electronics Telecommunications and Information Technologies / Communications
1.3 Field of study (name/code[3])	Electronics Telecommunications and Information Technologies Engineering / 20.20.10
1.4 Study cycle	Master
1.5 Study program (name/code/qualification)	Communications Networks Engineering / 20.20.10 /

2. Information about discipline

2.1a Name of discipline/The educational classe[4]	Advanced Video Compression Techniques / DS						
2.1b Name of discipline in Romanian	Tehnici Avansate în Compresia Video / DS						
2.2 Coordinator (holder) of course activities	Ș.l. dr. ing. Daniel Popa						
2.3 Coordinator (holder) of applied activities[5]	Ș.l. dr. ing. Daniel Popa						
2.4 Year of study[6]	1	**2.5** Semester	2	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DOB

3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities[8])

3.1 Number of hours fully assisted/week	4 ,of which:	course	2	seminar/laboratory/project		2
3.1* Total number of hours fully assisted/sem.	56 ,of which:	course	28	seminar/laboratory/project		28
3.2 Number of on-line hours fully assisted/sem	24 ,of which:	course	16	seminar/laboratory/project		8
3.3 Number of hours partially assisted/week	,of which:	project, research		training	hours designing M.A. dissertation	
3.3* Number of hours partially assisted/ semester	,of which:	project of research		training	hours designing M.A. dissertation	
3.4 Number of hours of unassisted activities/ week	6.7 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field				1.7
		Study using a manual, course materials, bibliography and lecture notes				2
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays				3
3.4* Total number of hours of unasssited asctivities/ semester	94 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field				24
		Study using a manual, course materials, bibliography and lecture notes				28
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays				42
3.5 Total hrs./week[9]	10.7					
3.5* Total hrs./semester	150					
3.6 No. of credits	6					

4. Prerequisites (where applicable)

4.1 Curriculum	•
4.2 Learning outcomes	•

5. Conditions (where applicable)

5.1 of the course	• Room with beamer, whiteboard
5.2 to conduct practical activities	• Laboratory with computers, beamer, whiteboard

6. Learning outcomes acquired through this discipline

Knowledge	• C3. The student/graduate knows open-source standards and licenses • C6. The student/graduate understands algorithms and structures for data processing • C9. The student/graduate knows ways to integrate knowledge from various fields • C12. The student/graduate understands the principles of scalability and resource allocation
Skills	• A1. The student/graduate applies qualitative and quantitative methodologies • A6. The student/graduate programs and optimizes scalable applications • A7. The student/graduate presents ideas and results in academic/professional contexts • A11. The student/graduate selects and applies communication methods appropriate to the context • A12. The student/graduate configures and optimizes ICT resources
Responsibility and autonomy	• RA2 The student/graduate assumes responsibility for the performance and reliability of the designed system • RA3 The student/graduate respects the principles of the open-source community and manages his/her own contributions • RA4 The student/graduate ensures the correctness and relevance of the conclusions drawn • RA7 The student/graduate ensures the quality and compliance with academic norms

7. Objectives of the discipline (based on the grid of learning outcomes acquired)

- Understanding the video signals transmission principles in communication networks and video compression standards.
- Introduction in image and video signals and their digitization parameters;
- Understanding the basic principles of video coding;
- Understanding the MPEG4 and H264 standards.
- Using open-source resources for implementation of compression algorithms

8. Content

8.1 Course	Number of hours	Of which online	Teaching methods
Baseband signals: image, video, voice, data;	3	1	exposure, direct interaction with the student, practical examples, comparative analyzes
Compression techniques: Lossless compression, Lossy compression;	2	1	
Video Compression: video formats, quality assessment (subjective methods, objective methods), video coding principles (video CODEC, temporal model, image model, entropy coding, hybrid DPCM/DCT CODEC), video compression standards;	5	2	
MPEG4 Visual standard: fundamental concepts (tools, objects, profiles levels), coding rectangular frames and arbitrary shape regions, scalability and scalable profiles, texture coding, studio profiles, coding synthetic elements;	10	6	
H.264 standard: fundamental concepts, structure, profiles.	8	6	

	Bibliography[10] 1. Iain E. G. Richardson, H.264 and MPEG-4 Video Compression – Video Coding for Next-generation Multimedia; John Wiley & Sons; England, 2003 2. M. Oteşteanu, Sistema de transmisie şi comutaţie; Editura Orizonturi Universitare; Timişoara, 2001		
8.2 Applied activities[11]	Number of hours	Of which online	Teaching methods
Introduction to OpenCV	2		Exposure, implementing software applications, solving problems
Image processing using rectangular blocks	2		
Forward and inverse Discrete Cosine Transform	4	2	
Quantization and rescaling	2		
Zigzag scan	4		
Run-level encoding/decoding	4	2	
Entropy coding/decoding	8	2	
Scalable video coding	2	2	
	Bibliography[12] 1. https://intranet.etc.upt.ro/~RDVV/Laborator/ 2. D. M. Escriva, R. Laganière, OpenCV 4 Computer Vision Application Programming Cookbook, Packt Publishing, 2019 3. A. Fernandez Villan, Mastering OpenCV 4 with Python, Packt Publishing, 2019 4. https://opencv.org/		

9. Evaluation

Type of activity	**9.1** Evaluation criteria[13]	**9.2** Evaluation methods	**9.3** Share of the final grade
9.4 Course	Acquiring the theoretical knowledge of the subject, understanding the principles methods and technologies presented in the course Applying the theoretical knowledge in practical applications with given numerical values	Online quiz on virtual campus: 20 subjects in 25 minutes 5 problems with online and written answers in 80 minutes	60%
9.5 Applied activities	**S:**		
	L: verifying the degree of understanding of studied principles and tasks fulfilling; end of semester test	Continuous assessment, oral and practical; final test written or online on virtual campus	40%
	P:		
	Pr:		
	Tc-R[14]:		
9.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified[15]			
• To pass the subject, the student must prove the understanding of the most important information presented in the course as well as the capacity to use the theoretical knowledge in practical applications. The exam consists of a 20 subjects quiz that evaluates theoretical knowledge and a 5 problems written examination which evaluates the student's ability to use theoretical knowledge in practical applications. To pass the semester activity the student must attend all the laboratory activities and obtain at least 50% of the maximum possible grade in the evaluation of these activities.			

Date of completion 25.09.2025	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
Head of Department (signature)	**Date of approval in the Faculty Council** [16] 07.10.2025	**Dean (signature)**