

SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty ¹ / Department ²	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/COM
1.3 Field of study (name/code ³)	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category ⁴	Digital Image Processing/DS						
2.2 Coordinator (holder) of course activities	S.I. dr. ing. David Ciprian						
2.3 Coordinator (holder) of applied activities ⁵	S.I. dr. ing. David Ciprian						
2.4 Year of study ⁶	4	2.5 Semester	8	2.6 Type of evaluation	E	2.7 Regime of discipline ⁷	DO

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) ⁸

3.1 Number of fully assisted hours / week	3 of which:	3.2 course	1.5	3.3 seminar / laboratory / project	0/1.5/0
3.1* Total number of fully assisted hours / semester	42 of which:	3.2* course	21	3.3* seminar / laboratory / project	0/21/0
3.4 Number of hours partially assisted / week	0 of which:	3.5 training	0	3.6 hours for diploma project elaboration	0
3.4* Total number of hours partially assisted / semester	0 of which:	3.5* training	0	3.6* hours for diploma project elaboration	0
3.7 Number of hours of unassisted activities / week	5.93 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			2
		hours of individual study after manual, course support, bibliography and notes			2
		training seminars / laboratories, homework and papers, portfolios and essays			1.93
3.7* Number of hours of unassisted activities / semester	83 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			28
		hours of individual study after manual, course support, bibliography and notes			28
		training seminars / laboratories, homework and papers, portfolios and essays			27
3.8 Total hours / week ⁹	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

4. Prerequisites (where applicable)

¹ The name of the faculty which manages the educational curriculum to which the discipline belongs

² The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

³ The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.

⁴ Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).

⁵ Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

⁶ Year of studies in which the discipline is provided in the curriculum.

⁷ Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).

⁸ The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.

⁹ The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	<ul style="list-style-type: none"> • Not the case
4.2 Competencies	<ul style="list-style-type: none"> • Not the case

5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> • Not the case
5.2 to conduct practical activities	<ul style="list-style-type: none"> • Not the case

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • - Identify appropriate solutions that lend themselves to imaging or video data • - Ability to implement specialised solutions to solve data analysis and interpretation problems • - Ability to analyse image or video data prior to choosing and implementing the appropriate solution to solve a specific problem
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. <p>Application of basic methods for signal acquisition and processing.</p> <p>Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrollers, programming languages and techniques.</p> <ul style="list-style-type: none"> • Design, implementation and service operation of data, voice, video multimedia, based on understanding and applying fundamental concepts in communications and information transmission..
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks • Definition of activity stages and their distribution to subordinates in terms of responsibilities, providing effective exchange of information and interpersonal communication. • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	<ul style="list-style-type: none"> • Knowledge of concepts and algorithms from image processing area • Appropriate solving of image processing problems by applying the studied algorithms
7.2 Specific objectives	<ul style="list-style-type: none"> • Students' understanding of the notions and concepts related to: punctual transformations of images, linear and nonlinear operators in image processing, image transformations, extraction of low and medium-level features in images, algorithms for processing the characteristics for segmentation, classifications and other algorithms that solve problems of automatic image interpretation • Developing the ability to decompose complex image processing problems and apply appropriate algorithms to solve them • Developing the ability to create computer programs to solve complex problems related to the processing and interpretation of images

8. Content ¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
1. Introduction	3	Slides, discussion, practical examples, comparative analysis
2. Point Processes	3	
3. Linear Filters	3	
4. Nonlinear Filters	3	

¹⁰ It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".

¹¹ Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

5. Geometrical transformations	3	
6. Edge Detectors	3	
7. Segmentation. Interest Points	3	

Bibliography ¹² 1. V. Gui, D. Lacrama, D. Pescaru, Prelucrarea Imaginilor, Editura Politehnica Timisoara, 1999.
2. R.C. Gonzales, R.E. Woods, Digital Image Processing, 3rd Edition, Prentice Hall, 2008.

8.2 Applied activities ¹³	Number of hours	Teaching methods
1. Brief Introduction to Matlab	3	Simulation, case study, problem solving, project method
2. Linear Filters	3	
3. Nonlinear Filters	3	
4. Conditional mean filter	3	
5. Geometrical transformations	3	
6. Edge Detectors	3	
7. Binarization by k-means algorithm	3	

Bibliography ¹⁴ 1. V. Gui, D. Lacrama, D. Pescaru, Prelucrarea Imaginilor, Editura Politehnica Timisoara, 1999.
2. R.C. Gonzales, R.E. Woods, Digital Image Processing, 3rd Edition, Prentice Hall, 2008

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- Image processing is a field that is applicable in a number of areas such as medicine, industry, army, or automation of any process that manages image or video data
- The content of the course is consistent with the content of similar courses from technical universities in the country and abroad

10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Knowledge of the presented image processing topics	Exam	50%
10.5 Applied activities	S:		
	L: the level of familiarity with the various algorithms presented and the ability to implement them in a programming language	Continuous evaluation, written examination	50%
	P¹⁶:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge			

¹² At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.

¹³ Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".

¹⁴ At least one title must belong to the discipline team.

¹⁵ Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

¹⁶ In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

is verified ¹⁷⁾

- 5 for course exam and 5 for laboratory work

Date of completion

10.06.2023

**Course coordinator
(signature)**

**Coordinator of applied activities
(signature)**

**Head of Department
(signature)**

Date of approval in the Faculty Council ¹⁸

14.09.2023

**Dean
(signature)**

¹⁷ It will not explain how the promotion mark is awarded.

¹⁸ The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.