DESCRIPTION OF THE COURSE OF STUDY

Course code		**0719-2DE-F60-DIP**
Name of the course in	Polish	**Przetwarzanie obrazów**
	English	**Digital Image Processing**

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	Data Engineering
1.2. Mode of study	Full-time
1.3. Level of study	Undergraduate engineering study
1.4. Profile of study	General academic
1.5. Person/s preparing the course description	Dr. Eng. Przemysław Ślusarczyk
1.6. Contact	pslusarczyk@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	English
2.2. Prerequisites	Basics of Mathematics Object Oriented Programming

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		lectures, laboratories, project
3.2. Place of classes		Courses in the UJK teaching rooms of the Faculty of Exact and Natural Sciences
3.3. Form of assessment		credit with grade (lectures, laboratories, project)
3.4. Teaching methods		lectures– informative lectures laboratories, project – laboratory method (practical classes using image processing tools and libraries)
3.5. Bibliography	**Required reading**	1. R.C. Gonzales, R.E. Woods, Digital Image Processing, Pearson 2008.
	Further reading	2. E.R. Davies: Computer and Machine Vision, Fourth Edition: Theory, Algorithms, Practicalities, Academic Press 2012.

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives (including form of classes)
Knowledge (lectures and laboratories) C1. To give a knowledge of fundamental image processing and compression methods. C2. To make understanding of the advantages and disadvantages of the image processing methods. **Abilities (laboratories and project)** C3. Developing skills to make use of data structures and methods related to the digital image processing. C4. Developing competence to cooperate in group. **Social competence (laboratories and project)** C5. Developing competence to provide expert knowledge related to the digital image processing.

4.2. Detailed syllabus (including form of classes)

Lectures:

1. Visual perception, acquisition and representation of images.
2. Spatial operations.
3. Intensity transformation and arithmetic operations.
4. Spatial filtering.
5. Filtering in the frequency domain.
6. Morphological image processing.
7. Colors and color spaces.
8. Color management.
9. Color image processing.
10. Lossless image compression methods
11. Lossy image compression methods

Laboratories:

1. Image processing software and libraries.
2. Data structures applicable to image processing.
3. Spatial operations.
4. Intensity transformation and arithmetic operations.
5. Spatial filtering.
6. Filtering in the frequency domain.
7. Morphological image processing.
8. Color image processing.

Project:

Students cooperates in groups to design and implement low complexity image processing software.

4.3. Education outcomes in the discipline

Code	A student, who passed the course	Relation to learning outcomes
	within the scope of **KNOWLEDGE:**	
W01	has fundamental knowledge of spatial and spectral image processing methods	ID1A_W06
W02	has fundamental knowledge of image compression methods	ID1A_W06
	within the scope of **ABILITIES:**	
U01	performs image enhancement using software libraries	ID1A_U07 ID1A_U08 ID1A_U13
U02	has skills to combine image processing and compression methods to solve the specified problem	ID1A_U07 ID1A_U08 ID1A_U13
	within the scope of **SOCIAL COMPETENCE:**	
K01	has competence to provide an expert knowledge related to digital image processing.	ID1A_K03 ID1A_K04

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	Method of assessment (+/-)																				
	Test			Project			Self-study			Group work											
	Form of classes			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*		
	L	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*
W01	+																				
W02	+																				
U01						+			+			+									
U02						+			+			+									
K01	+								+			+									

4.5. Criteria of assessment of the intended learning outcomes		
Form of classes	**Grade**	**Criterion of assessment**
lecture (L)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points
classes (C)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points
project (P)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/		
Participation in lectures	30	
Participation in laboratories	45	
Preparation for the exam		
Others		
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/		
Preparation for the lecture		
Preparation for the laboratories	10	
Preparation for the exam		
Gathering materials for the project	40	
Preparation of multimedia presentation		
Others		
TOTAL NUMBER OF HOURS	***125***	
ECTS credits for the course of study	**5**	

Accepted for execution *(date and signatures of the teachers running the course in the given academic year)*

.....