

Description of course

Code of course	1150-00000-ISA-0306
Name of course	Image Processing and Analysis
Version of course	2

A. Place of the course in system of studies

Level of education	First cycle studies
Form and mode of studies	full-time
Profile of studies	General academic profile
Specialisation	-
Place of teaching of course	Faculty of Automotive and Construction Machinery Engineering
Place of realization of course	Faculty of Automotive and Construction Machinery Engineering
Coordinator of course	Jacek Dybała, PhD, DSc, University Professor

B. General characteristic of the course

Block of courses	Directional
Group of courses	Mandatory
Type of course	Compulsory
Language of course	angielski
Nominal semester	6 (r.a. 2019/2020)
Time of completion in the academic year	summer semester
Preliminary requirements	Basic knowledge of image processing. Computer skills, basic knowledge in programming.
Limit of students	No limit on the student number at the lecture. The maximum number of students taking part in laboratory classes is 30 people.

C. Effects of education and manner of teaching

Purpose of course	Familiarizing students with advanced methods of image processing and basic methods of image analysis. Teaching students to create programs for image processing and analysis.	
Effects of education	See Table 1.	
Form of didactic studies and number of hours per semester	Lecture	15h
	Exercise type of course	0h
	Laboratory	30h
	Project type of course	0h
	Computer lessons	0h
Contents of education	Lecture: Fourier transformation of digital images. Contextual image filtering. Linear and non-linear contextual filters. Basic and complex morphological transformations of images. Morphological transformations of binary images. Detection of contour lines using Hough transform. Image segmentation. Image labeling. Determination of global features of images. Determining the features of objects visible in images. Lab: Image acquisition. Data structure used to represent digital images and methods of their conversion. Geometrical, arithmetic and logical transformations of images. Point transformations of images. Fourier transformation of digital images. Image filtering in the spatial domain. Morphological image processing.	

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	Detection of contour lines using Hough transform. Image segmentation. Image analysis. Determining the features of objects visible in images.
Methods of evaluation	Lecture: Completion of the lecture part of the subject takes place on the basis of a test. A condition necessary to obtain the credit for the subject is achieving at least the minimum pass grade (3) for the test. Lab: A condition necessary for completing the laboratory part of the subject is performing all the laboratory exercises provided for in the schedule for a given semester, and obtaining at least the minimum pass grade (3) for every exercise. The person conducting the exercise assesses each exercise based on checking the correctness of this laboratory exercise. A necessary condition to obtain a pass mark for this subject is to pass the lecture and laboratory parts of the subject. The total mark from the subject is the weighted average of the grades from the lecture and laboratory parts of the subject.
Methods of verification of effects of education	See Table 1.
Exam	no
Literature	[1] A. Bovik (Editor), Handbook of Image & Video Processing. Academic Press, 2000. [2] R.C. Gonzalez, R.E. Woods, Digital Image Processing. Prentice Hall, 2002. [3] R.C. Gonzalez, R.E. Woods, S. L. Eddins, Digital Image Processing using Matlab. Prentice Hall, 2004. [4] M.S. Nixon, A.S. Aguado, Feature Extraction and Image Processing, Academic Press, 2008 [5] O. Marques, Practical Image and Video Processing Using Matlab. John Wiley & Sons, 2011.
Website of the course	
D. Student's activity	
Number of ECTS credits	3
Number of hours of student's work to achieve effects of education	1) Number of contact hours/ – 47 hours, including: a) lecture – 15 hours; b) lab – 30 hours; c) consultations – 2 hours. 2) Student's own work – 35 hours, including: a) literature studies – 10 hours; b) preparing student for the test – 5 hours; c) preparing student for laboratory exercises – 20 hours. 3) TOTAL – 82 hours.
Number of ECTS credits on the course with direct participation of academic teacher	1.9 points ECTS – number of contact hours – 47 hours, including: a) lecture – 15 hours; b) lab – 30 hours; c) consultations – 2 hours.
Number of ECTS credits on practical activities on the course	2 points ECTS – 50 hours, including: a) lab – 30 hours; b) preparing student for laboratory exercises – 20 hours.
E. Additional information	
Notes	-
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Table 1. Course's learning outcomes

General academic profile - knowledge

Code of effect:	1150-PE000-ISP-0336_W1
Effect:	A student who has passed the course possesses detailed knowledge of image processing and analysis methods.
Verification:	Test
Field of study related learning outcomes	K_W07
Area of study related learning outcomes	T1A_W02, T1A_W04

General academic profile - skills

Code of effect:	1150-PE000-ISP-0336_U1
Effect:	A student who has passed the course can gain information from context-sensitive help systems in the development environment (in English); A student can integrate obtained information, interpret it and use it in software development.
Verification:	Quality control of self-written software
Field of study related learning outcomes	K_U01, K_U24
Area of study related learning outcomes	T1A_U01, T1A_U15

Code of effect:	1150-PE000-ISP-0336_U2
Effect:	A student who has passed the course can build programs for image processing and analysis.
Verification:	Quality control of performing laboratory exercises
Field of study related learning outcomes	K_U08, K_U18
Area of study related learning outcomes	T1A_U08, T1A_U09, T1A_U16

General academic profile - social competences

Code of effect:	1150-PE000-ISP-0336_K1
Effect:	A student who has passed the course can properly determine the priorities for the performance of the task determined by other people.
Verification:	Quality control of performing laboratory exercises
Field of study related learning outcomes	K_K04
Area of study related learning outcomes	T1A_K03, T1A_K04