**Nazwa przedmiotu:**

Image Processing and Analysis

**Koordynator przedmiotu:**

Jacek Dybała, PhD, DSc, University Professor

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Obowiązkowe

**Kod przedmiotu:**

1150-00000-ISA-0306

**Semestr nominalny:**

6 / rok ak. 2022/2023

**Liczba punktów ECTS:**

3

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

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.

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

1.9 points ECTS – number of contact hours – 47 hours, including:
a) lecture – 15 hours;
b) lab – 30 hours;
c) consultations – 2 hours.

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

2 points ECTS – 50 hours, including:
a) lab – 30 hours;
b) preparing student for laboratory exercises – 20 hours.

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład:  | 15h |
| Ćwiczenia:  | 0h |
| Laboratorium:  | 30h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

Basic knowledge of image processing. Computer skills, basic knowledge in programming.

**Limit liczby studentów:**

No limit on the student number at the lecture. The maximum number of students taking part in laboratory classes is 30 people.

**Cel przedmiotu:**

Familiarizing students with advanced methods of image processing and basic methods of image analysis. Teaching students to create programs for image processing and analysis.

**Treści kształcenia:**

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. Detection of contour lines using Hough transform. Image segmentation. Image analysis. Determining the features of objects visible in images.

**Metody oceny:**

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.

**Egzamin:**

nie

**Literatura:**

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.

**Witryna www przedmiotu:**

**Uwagi:**

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## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt 1150-PE000-ISP-0336\_W1:**

A student who has passed the course possesses detailed knowledge of image processing and analysis methods.

Weryfikacja:

Test

**Powiązane efekty kierunkowe:** K\_W07

**Powiązane efekty obszarowe:** T1A\_W02, T1A\_W04

### Profil ogólnoakademicki - umiejętności

**Efekt 1150-PE000-ISP-0336\_U1:**

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.

Weryfikacja:

Quality control of self-written software

**Powiązane efekty kierunkowe:** K\_U01, K\_U24

**Powiązane efekty obszarowe:** T1A\_U01, T1A\_U15

**Efekt 1150-PE000-ISP-0336\_U2:**

A student who has passed the course can build programs for image processing and analysis.

Weryfikacja:

Quality control of performing laboratory exercises

**Powiązane efekty kierunkowe:** K\_U08, K\_U18

**Powiązane efekty obszarowe:** T1A\_U08, T1A\_U09, T1A\_U16

### Profil ogólnoakademicki - kompetencje społeczne

**Efekt 1150-PE000-ISP-0336\_K1:**

A student who has passed the course can properly determine the priorities for the performance of the task determined by other people.

Weryfikacja:

Quality control of performing laboratory exercises

**Powiązane efekty kierunkowe:** K\_K04

**Powiązane efekty obszarowe:** T1A\_K03, T1A\_K04