

Cracow University of Technology

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies
in the academic year 2022/2023

Information on the course

Name of the course in Polish	Analiza obrazu
Name of the course in English	Image analysis
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Choosable
Field of education	Engineering and technology
Discipline of education	Mechanical engineering
Person responsible for the course Contact	Prof. Leszek Wojnar, <i>doctor habilitatus</i> leszek.wojnar@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical classes	Laboratory	Computer Lab	Project Class	Seminar
2, 3, 4, 5	G	15	0	0	0	0	0

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Introduction to the algorithms and possibilities of computer image analysis.
Objective 2	Getting familiar with the possibilities of automating image analysis.

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUD DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands the areas of applications, transformation and computer image analysis procedures.	E_W01, E_W02	Multiple-choice test.
EUW2	The doctoral student knows the development trends and the possibilities of automating image analysis.	E_W01, E_W02	Multiple-choice test.
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to interpret an image processing or analysis algorithm.	E_U01	Multiple-choice test.

EUU2	The doctoral student is able to select an appropriate image analysis method for a simple problem.	E_U01	Multiple-choice test.
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is prepared to cooperate in the application of image analysis methods in scientific research and quality control.	E_K01, E_K03	Multiple-choice test.

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Digital images, their varieties, features and applications, the history of the development of image analysis methods, and image acquisition.	E_W01	2
W2	Point transformations (geometric, histogram, logical, arithmetic, binarization).	E_W01, E_K01	2
W3	Contextual transformations (filters) and morphological transformations, analysis of colour images.	E_W01, E_U01	3
W4	Image processing leading to the possibility of taking measurements. Measurements. Elements of stereology.	E_W01, E_U01	4
W5	Advanced analysis methods - Fourier transformation, Hough's method, machine learning.	E_W01, E_K02	2
W6	Construction of image analysis algorithms. Development trends in image analysis methods.	E_W01, E_W02, E_U01, E_K01, E_K02	2

The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH AN ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	4
Examination / course credit assignment	1
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	10
Preparation of a paper, a report, a project, a presentation, a discussion	
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	None specified. A graduate of second-cycle technical studies should have knowledge and skills in the field of IT techniques and the basics of statistics sufficient to assimilate the entire material.

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	Passing the multiple-choice test on the subject of the lectures.
METHOD OF THE FINAL GRADE CALCULATION	
The course credit and the grade are based on the number of points scored. For a rating of 5.0, at least 90% of the maximum possible number of points should be obtained in the test, and for the remaining assessments, the criteria are as follows: for a rating of 4.5 - 80%, for a rating of 4.0 - 70%, for a rating of 3.5 - 60%, and to pass with the grade of 3.0 - 50% of the maximum possible number of points are required.	

Additional information

None specified.

The course reading list

1	Wojnar L., <i>Analiza obrazu. Jak to działa?</i> , Kraków, 2020, Politechnika Krakowska (pozycja dostępna w wersji elektronicznej w Bibliotece Politechniki Krakowskiej).
2	Wojnar L., Kurzydłowski K.J., Szala J., <i>Praktyka analizy obrazu</i> , Kraków, 2002, Polskie Towarzystwo Stereologiczne (pozycja dostępna w wersji elektronicznej w Bibliotece Politechniki Krakowskiej).
3	Russ J.C., <i>The image processing handbook</i> , Boca Raton, 1995, CRC Press, Second Edition lub dowolna późniejsza edycja.