STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Image processing and analysis		**1010331541010339874**
Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics in Technology	**general academic**	**3 / 6**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Modelling in technics	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies (Polish Qualifications Framework level six)	**full-time**	

No. of hours				No. of credits
Lecture: **30**	Classes: **-**	Laboratory: **30**	Project/seminars: **-**	**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
Technical sciences	**5 100%**
Technical sciences	**5 100%**

Responsible for subject / lecturer:

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Faculty of Electrical Engineering
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	1. Has an extended in-depth knowledge on a range of branches of higher mathematics and specific knowledge regarding the application of mathematical tools and techniques in engineering - [K_W01 (P6S_WG)] 2. Has an ordered, theoretically grounded knowledge on computer science, including numerical methods; knows at least one programming package or language [K_W06 (P6S_WG)]
2	**Skills**	1. Is capable of devising an algorithm to solve a simple engineering task; can implement and test the algorithm in selected development environment [K_U04 (P6S_UW)]
3	**Social competencies**	1. Is aware of the level of his/her knowledge w.r.t. the state of the art in technical and engineering research [K_K01 (P6S_KK)]

Assumptions and objectives of the course:

The aim of the course is to learn the basics of methods of image acquisition and processing and gain the knowledge on typical applications of image processing systems. After completing the course, the student should be able to select an algorithm or a set of algorithms fort the implementation of a complete intelligent vision system.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has an extended in-depth knowledge on a range of branches of higher mathematics and specific knowledge regarding the application of mathematical tools and techniques in engineering - [K_W01 (P6S_WG)]
2. Has an ordered, theoretically grounded knowledge on computer science, including numerical methods; knows at least one programming package or language [K_W06 (P6S_WG)]
3. Has a structured knowledge on signal theory, measurement technology and data acquisition and analysis [K_W07 (P6S_WG)]
4. Knows and understands engineering technologies and is aware of the latest development trends in his/her study field [K_W11 (P6S_WG)]

Skills:

1. Is capable of formulating an engineering problem, carry out detailed research using analytical, simulation or experimental methods interpret the results and draw conclusions - [K_U05 (P6S_UW)]
2. Can select appropriate method and measurement equipment to make basic measurements of physical quantities; can use basic data processing and analysis methods - [K_U07 (P6S_UW)]
3. Can use tools and devices according to the general guidelines and specific documentation; is capable of observing workplace safety regulations - [K_U09 (P6S_UW)]

Social competencies:

1. Is aware of the level of his/her knowledge w.r.t. the state of the art in technical and engineering research [K_K01 (P6S_KK)]
2. Is aware of the necessity of expanding one's knowledge to solve more recent technical problems [K_K02 (P6S_KK)]
3. Understands and appreciates the importance of intellectual honesty and in his/her own and other poeople's actions; is capable to demonstrate reliability, impartiality, professionalism and ethical attitude [K_K04 (P6S_KR)]

Assessment methods of study outcomes

Lecture: A written exam at the end of the semester.

Laboratory: Completing laboratory exercises and practical exam at the end of the semester.

Course description

Image acquisition, image encoding methods, video encoding. The use of OpenCV library for image processing. Colour spaces and histograms. Early image processing - local methods (Gamma correction, histogram-based processing, etc.) and local contextual methods - convolution, linear and non-linear filtration; morphological operations. Detection of features (line, points). Image feature and region descriptors. Shape analysis. Geometric transformations. Introduction to video sequence analysis. Introduction to machine learning methods in image processing - using scikit-learn and TensorFlow libraries.

Update: 10.2018

Basic bibliography:

1. R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010
2. Additional course metaerial published on university MOOC platform

Additional bibliography:

1. Selection of additional online resources

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Laboratory exercises	30
3. Exam preparation	30
4. Laboratory preparation	20
5. Meeting hours	10
6. Student's own work - practical exercises	30

Student's workload

Source of workload	hours	ECTS
Total workload	150	5
Contact hours	70	3
Practical activities	60	2