(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: BIG DATA, Visual Data	**2. Course code BG_VD**
3. Validity of course description: 2018/2019	
4. Level of studies: MSc programme	
5. Mode of studies: intramural studies	
6. Field of study: CONTROL, ELECTRONIC AND INFORMATION ENGINEERING (MACRO)	(FACULTY SYMBOL) RAU-2
7. Profile of studies: ACADEMIC	
8. Programme: DATA SCIENCE	
9. Semester: 2	
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science	
11. Course instructor: Dr inż. Przemysław Skurowski	
12. Course classification: common courses	
13. Course status: compulsory ~~/elective~~	
14. Language of instruction: English	
15. Pre-requisite qualifications: Algebra and analytic geometry, Calculus and differential equations, Physics, Computer programming, Optimization methods, Numerical methods, Statistics and probability theory, Algorithms and data structures.	
16. Course objectives: The aim of the course is making the student familiar with methods, algorithms and tools for visual data analysis, These data may come from various imaging sources, such as visible light cameras, X-rays, USG or magnetic resonance..	
17. Description of learning outcomes:	

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student acquires extended knowledge on image acquisition, processing, digital representation and its application areas	Test	Lecture	K2A_W19, K2A_W21, K2A_K02
2.	Student acquires extended knowledge on human visual information processing	Test	Lecture	K2A_W19, K2A_W21
3.	Student acquires knowledge and advanced skills in image processing and understanding	Lab reports	Laboratory	K2A_W19, K2A_U07
4.	Student learns to understand and use the principal techniques comprising the chain of processing from raw raster image to description of planar forms and their change over time	Lab reports	Laboratory	K2A_W19, K2A_U06, K2A_U07 K2A_K01, K2A_K02
5.	Student acquires knowledge and skills in problem solving, critical reading reference literature, and technical documentation.	Project report	Project	K2A_U01, K2A_U02, K2A_U05, K2A_U06, K2A_U09, K2A_K07
6.				

7.				
8.				

18. Teaching modes and hours

Lecture 30 / ~~BA /MA Seminar / Class /~~ Project 15 / Laboratory 15

19. Syllabus description:

Lecture:

1. Introductory issues. Imaging process basics . Overview of the course contents.
2. Digital image representation, Sampling, Spectral representation and interpretation of spectra. Spatio-frequency domain as a tradeoff between the decomposition and localization.
3. Color:
   - psychophysics and bio-cybernetics. Color formation theories, models. Quantized representation
   - applications – colorimetry, color spaces and conversions
4. Image filtering – linear and statistical filters
5. Mathematical morphology – basic and compound operations – erosion, dilation, opening …, exemplary applications for segmentation of image contents
6. Local features detection – edges and corners
7. Multiresolution representation with applications for image filtering and fusion
8. Texture analysis – filter banks, granulometry, statistical descriptors
9. Classification and clusterization applied for the image analysis
10. Human vision
11. Specialized applications (e.g. biomedical image analysis)

Laboratory:

1. Discrete image representation
2. Filtering
3. Morphology
4. Features detection
5. Visual data recognition
6. Vision in humans

Projects

small teams students, tutored by the instructors, will face assignments – some application problems (case studies) requiring to propose own idea. It would require to perform critical review (research) of available techniques, propose solution of the problem and prototype. Exemplary projects:

1. Counting the crowd in aerial photos
2. 3D reconstruction of MRI images
3. Analysis of retinal images
4. Road traffic estimation

20. Examination: semester NO

21. Primary sources:

R. Szeliski, (2010), Computer Vision: Algorithms and Applications, Springer (available online: http://szeliski.org/Book)

22. Secondary sources:

I.T. Young, J.J. Gerbrands, L.J. van Vliet; Image Processing Fundamentals , Online book.

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	/
3	Laboratory	15/15
4	Project	15/15
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	60/60

24. Total hours: 120

25. Number of ECTS credits: 3

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):2

26. Comments:

Approved:

…….
(date, Instructor's signature)

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(*date , the Director of the Faculty Unit signature)*