COURSE DESCRIPTION CARD – SPECIMEN

Faculty of Mechanical Engineering									
Field of study	**Automatic Control and Robotics**							**Degree level and programme type**	**Bachelor's degree/Master's degree/Doctoral degree**
Specialization/ diploma path								**Study profile**	
Course name	**Autonomous Flying Robots**							**Course code**	**IS-FME-00134W**
								Course type	**Obligatory/elective**
Forms and number of hours of tuition	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**winter**
	30		**15**	**15**				**No. of ECTS credits**	**5**
Entry requirements	**Robotics, Control Systems**								
Course objectives	**knowledge about the autonomous flying robots, perception and sensors for flying robots, motion planning and control, localization, trajectory tracking**								
Course content	**Mechanics (dynamics and kinematics) of flying robots, modelling and simulation, three-dimensional sensors (projected light depth cameras, time of flight cameras, point cloud registration and processing), actuators in autonomous flying robots, path planning methods (probabilistic planning, potential field), localization methods for flying robots (inertial, vision based, SLAM), obstacle avoidance systems for flying robots, navigation of flying robots, reconfiguration, fail safe functions and diagnostics**								
Teaching methods	**Lectures with multimedia presentations, laboratory classes with experiments with using flying robots, projects with computer simulations**								
Assessment method	**lecture – written and oral exam; laboratory classes – evaluation of reports and oral exam; project – project completion, presentation and discussion**								
Symbol of learning outcome	**Learning outcomes**								**Reference to the learning outcomes for the field of study**
LO1	**can describe image processing methods for the use to UAV trajectory generation and correction**								
LO2	**has knowledge about design, simulation and testing control algorithms and strategies for autonomous flying robots**								
LO3	**has knowledge about autonomous navigation of flying**								

	robots	
LO4	can describe and modelling of autonomous flying robots components	
LO5	can design multi-criteria control algorithms and path planning algorithms for flying robots	
LO6	can design diagnostics functions and fail safe functions for flying robots	

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	participation in lectures	L
LO2	participation in lectures and projects	L, P
LO3	participation in lectures, laboratory classes and projects	L, LC, P
LO4	participation in projects, realization of project exercises	P
LO5	participation in projects, solution of project exercises, participation in laboratory classes and realization of laboratory exercises	LC, P
LO6	participation in projects, solution of project exercises, participation in laboratory	LC, P

Student workload (in hours)		No. of hours
Calculation	lecture attendance	30
	participation in classes, laboratory classes, etc.	30
	preparation for classes, laboratory classes, projects, seminars, etc.	47
	working on projects, reports, etc.	10
	participation in student-teacher sessions related to the classes/seminar/project	4
	implementation of project tasks	10
	preparation for and participation in exams/tests	5
	TOTAL:	136

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	64	2.5
Student workload – practical activities	86	3

Basic references	1. Beard R., McLain T. W., Small Unmanned Aircraft: Theory and Practice, Princeton University Press, 2012 2. Valavanis K. P., Vachtsevanos G. J., Handbook of Robotics, Springer-Verlag Gmbh, 2008 3. Napolitano M. R., Aircraft Dynamics, from modelling to simulation, John Wiley & Sons, 2012
Supplementary references	1. Bovik A., Handbook of Image and Video Processing, Academic Press, 1st edition, 2000 2. Bestaoui S. Y., Smart Autonomous Aircraft, flight control and planning for UAV, 2016

Organisational unit conducting the course	Department of Robotics and Mechatronics	Date of issuing the programme
Author of the programme	Leszek Ambroziak, Dr. Eng.	20.03.2021

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,

S – seminar