STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Flight Planning		**1010532121010600040**

Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Smart Aerospace and Autonomous Systems	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **15**	Classes: **-**	Laboratory: **-**	Project/seminars: **-**	**3**

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

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

płk dr inż. pil. Krzysztof Szymaniec
email: krzysztof.szymaniec@put.poznan.pl
tel. 61 665 2604
Faculty of Transport Engineering
ul.Piotrowo 3, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student starting this module should have basic knowledge regarding flying robots.
2	**Skills**	He/she should have skills allowing solving basic problems related to aerial robotics and should understand the need to extend his/her competences.
3	**Social competencies**	Student should show attitudes as honesty, responsibility, perseverance, curiosity, creativity, manners, and respect for other people.

Assumptions and objectives of the course:

The objective of the course is to focus on four principal tasks:

1. Path planning (determining an optimal path for vehicle to go while meeting certain objectives and constraints)
2. Avoiding obstacles and collision, trajectory generation (determining an optimal control maneuver to take to follow a given path or to go from one location to another)
3. Task allocation and scheduling (determining the optimal distribution of tasks amongst a group of agents, with time and equipment constraints)
4. Deterministic and probabilistic planning approaches

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

Knowledge:

1. acquire knowledge on aerial robots - [K_W4]
2. have wide and in-depth knowledge on flight planning - [K_W5]
3. be informed about trends and advances in avionics - [K_W6]
4. know methodology of carrying out experiments with flight planning - [K_W8]

Skills:

1. is able to acquire, integrate, interpret and evaluate information from literature, databases and www sources on modelling, control and planning of aerial robots - [K_U1]
2. is able to plan and arrange self-education process in particular covering issues of aerial robot planning - [K_U5]
3. is able to apply control and planning methods to solve engineering as well as scientific problems - [K_U9]
4. is able to integrate knowledge coming both from different sub-domains of computer sciences and robotics to formulate and solve engineering tasks - [K_U10]
5. can conduct experimental studies and analyse their results with statistical tools - [K_U12]
6. is able to evaluate strong and weak points of algorithms and their implementation and asses their usefulness to flight planning tasks - [K_U13]

Social competencies:
1. understands that knowledge and skills related to avionics quickly becomes non relevant - [K_K1]
2. knows examples / case studies of flight planning, simulation and analysis and understands their limitations - [K_K4]
3. is able to correctly assign priorities to own tasks - [K_K6]

Assessment methods of study outcomes
Formative assessment: a) lectures: based on answers to question in the written exam, b) laboratory classes: evaluation of doing correctly assigned tasks (following provided lab. instructions). Total assessment: a) verification of assumed learning objectives related to lectures: i.evaluation of acquired knowledge on the basis of the written exam, ii.discussion of correct answers in the exam, b) verification of assumed learning objectives related to laboratory classes: i.evaluation of student?s knowledge necessary to prepare, and carry out the lab tasks, ii.monitoring students? activities during classes, iii.evaluation of lab reports (partly started during classes, finished after them), iv.two written tests during the classes. Additional elements cover: i.discussing more general and related aspects of the class topic, ii.showing how to improve the instructions and teaching materials. Session 1: Note de contrôle continu (CC): Note CC = 50% TP + 50% DS (TP = moyenne des Travaux Pratiques et/ou Devoirs Maison; DS = un Devoir Surveillé ? mi-semestre). Note finale de Module = 50% CC + 50 % examen; en l'absence de DS: Note finale de Module = 30% TP + 70% examen. Session 2: Note finale de Module = maximum entre 100% examen session 2 et 50% CC session 1 + 50% examen session 2 ou 30% TP session 1 + 70% examen session 2.

Course description
1. Path planning 2. Obstacle and collision avoidance 3. Trajectory generation 4. Task allocation and scheduling 5. Case studies Learning methods: 1. Lectures: multimedia presentation, presentation illustrated with examples presented on black board, solving tasks, multimedia showcase 2. Labs: solving tasks, practical exercises, discussion, teamwork, multimedia showcase, competitions or case studies

Basic bibliography:
1. Planning and decision making of aerial robots, Y. Bestaoui, Springer 2014
2. Lighter than air robots, Y. Bestaoui, Springer 2012

Additional bibliography:

Result of average student's workload	
Activity	**Time (working hours)**

1. participating in lectures	15
2. consulting issues related to the subject of the course	3
3. studying literature / learning aids, 250 pages	25
4. preparing to and participating in exams	32

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	75	3
Contact hours	20	1
Practical activities	0	0