

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>The air navigation</b>		Code <b>1010601141010637635</b>
Field of study <b>Aerospace Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>2 / 4</b>
Elective path/specialty <b>Aircraft Piloting</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>1</b> Classes: <b>2</b> Laboratory: <b>-</b> Project/seminars: <b>-</b>		No. of credits <b>2</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>2 100%</b> <b>2 100%</b>
<b>Responsible for subject / lecturer:</b> mgr inż. Kajetan Szymańczyk email: kajetan.szymanczyk@gmail.com tel. +48 781 325 595 Faculty of Transport Engineering ul. Piotrowo 3 60-965 Poznań		<b>Responsible for subject / lecturer:</b> dr hab. inż. Agnieszka Wróblewska email: agnieszka.wroblewska@put.poznan.pl tel. +48 784 698 595 Faculty of Transport Engineering ul. Piotrowo 3 60-965 Poznań
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	in the field of basic information about the shape of the Earth, coordinate systems and references, and the basics of radio navigation [PRK4]
2	<b>Skills</b>	can apply the scientific method in solving problems [PRK4]
3	<b>Social competencies</b>	knows the limits of own knowledge and skills; can work in a group [PRK4]
<b>Assumptions and objectives of the course:</b> familiarizing the student with the practical implementation of navigational tasks related to the planning, preparation and execution of a flight in selected environmental and operational conditions, time changes, the use of typical navigational and radionavigation devices, the use of radar equipment, interpretation of measurement results, assessment of correct operation and estimation of navigational and radio navigation equipment errors. The ability to use satellite systems receivers used in navigation, interpretation of indications and the assessment of the possibility of using satellite systems in particular types and phases of navigation, the use of navigation methods in professional aviation operations. The ability to use in practice the calculation of parameters of the grouping		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. has detailed knowledge related to selected issues in the field of navigation and flight techniques and the use of flight simulators - [K1A_W16]		
<b>Skills:</b> 1. knows how to use native and international languages to the extent that it allows to understand technical texts and write technical descriptions of machines in the field of aviation and astronautics (technical terminology) - [K1A_U01] 2. can assess the material, environmental and labor costs for the implementation of flight modules and on-board devices - [K1A_U14] 3. can draw a schematic and a simple machine element in accordance with the principles of technical drawing - [K1A_U16]		
<b>Social competencies:</b> 1. is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions - [K1A_K02] 2. can interact and work in a group, taking on different roles in it - [K1A_K03]		

<b>Assessment methods of study outcomes</b>		
computer exam using Aviationexam software		
<b>Course description</b>		
<p>Basic information about the shape of the Earth. Coordinate and reference systems. Loxodroma and orthodroma. Units of measurement used in navigation. Navigational flight parameters. Magnetism and compass. Maps. Work on the map. Counting navigation. Navigation during the flight. The use of navigational calculators. The basics of radio navigation. Radio navigation aids and their use in flight. Basic principles of radar operation. Types of radars. The use of on-board and ground radars. Independent navigation systems and systems based on external signals. Satellite navigational systems - architecture, functions, characteristics, techniques and measurement errors. Basics of using satellite devices and receivers. Formation and disbanding of aviation battle groups.</p>		
<b>Basic bibliography:</b>		
<ol style="list-style-type: none"> <li>1. Narkiewicz J., Podstawy układów nawigacyjnych, PWN, Warszawa 1999 r.</li> <li>2. Ortyl A., Autonomiczne systemy nawigacji lotniczej, WAT, Warszawa 2000 r.</li> <li>3. Janik F., Malinowski C., Podstawowa nawigacja lotnicza, Wydawnictwa komunikacyjne, Warszawa 1957 r.</li> <li>4. Wyrozumski W., Podręcznik nawigacji lotniczej, Aeroklub PRL,</li> <li>5. Polak Z., Rypulak A., Bilski J., Awionika, przyrządy i systemy pokładowe, WSOSP, Dęblin 1999 r.</li> <li>6. Wolper James S., Understanding mathematics for aircraft navigation, McGraw-Hill Companies Inc, 2001 r.</li> <li>7. Narkiewicz J., Globalny system pozycyjny. WKiŁ 2003 r.</li> <li>8. Advanced Avionics Handbook FAA-H-8083-6, Federal Aviation Administration. Washington 2009 r.</li> </ol>		
<b>Additional bibliography:</b>		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. Participation in the exam / pass	45	
2. Participation in classes (according to plan)	5	
3. Preparation for the exam / pass	1	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	51	2
Contact hours	46	1
Practical activities	32	1