Institute of Navigation – general information

Field of study: *Navigation*

Type of qualification: BSc Eng.

Mode of study: full-time, part-time

Duration: 3,5 years

Specialization: air traffic management, operation of airport navigation infrastructure

Educational profile:

- tactical navigation - military studies
- air traffic management - civil and military studies
- global navigation systems GNSS - civil studies

Language of instruction: Polish; English – only for the Erasmus+ incoming students

Characteristics of qualification: The studies prepare high-quality professionals responsible for the operation of the navigation systems and air traffic management. The graduate of the first-cycle studies obtains a university degree and professional qualifications to perform a function in the air transport related institutions and its services. Moreover, the graduate will have a theoretical background to work in research teams related to aviation, land, maritime and air traffic. The navigation graduate receives the title of the engineer. A graduate of the first-cycle studies in the field of airport infrastructure has extensive knowledge of the theoretical foundations of navigation and radio navigation, the construction, and operation of airport infrastructure and the ability to operate radio navigation equipment and systems, especially those which serve as aerodrome equipment. The first-cycle degree graduate in air traffic management has extensive knowledge of airspace management systems, air traffic flow management and organization, and air traffic management skills using radar and radio communication systems and equipment.

Institute of Navigation – general information

Field of study: Navigation

Type of qualification: MSc Eng.

Mode of study: full-time, part-time

Duration: 1,5 years

Specialization: air traffic management, operation of airport navigation infrastructure

Educational profile:

- air traffic management - civil and military studies

Language of instruction: Polish, English – only for the Erasmus+ incoming students

Characteristics of qualification: A graduate of the second-cycle studies of Navigation will gain a master's degree and a professional qualification to perform functions in the air transport related institutions and their service, in accordance with the completed education specialization. He will also have the necessary theoretical background to work in research teams related to air navigation, especially air traffic services. The graduate will receive a master's degree in engineering.

COURSE CATALOGUE OFFER

Academic year: 2020/21

Institute of Navigation

Field of study: Navigation

ISCED – F code: 0716

Language of instruction: English

Index	Name of the course according to the module	Number of hours	ECTS	Number of hours according to the mode of study			
				lectures	exercises	self-study	project
	Core Module						
1	*Navigation*	30	2	15	15	30	
2	*Satellite navigation systems*	30	2	15	15	30	
3	*Safety in navigation*	30	2	15	15	30	
4	*GIS*	30	2	15	15	30	
	Specialized Module						
1	*Statistics*	30	2	15	15	30	
2	*Methods of precision satellite positioning*	30	2	15	15	30	
3	*Aeronautical telecommunication*	30	2	15	15	30	
4	*Systems of telecasts data in navigation*	30	2	15	15	30	
5	*Real time methods*	30	2	15	15	30	
6	*Programming languages*	30	2	15	15	30	
Total	**ECTS**		**20**				

Description of the modules

Core Module

1. *Navigation*

Educational content:

Basic knowledge of the Earth's shape and dimensions. Geographical coordinates system. Loxodrome and orthodrome. Traditional navigation units of measures. Essence and content of the map. Kinds of cartographic projections. Navigation infrastructure and its elements. Distances and directions and in navigation. Methods of positioning and dead reckoning navigation, positional line, 1 in 60 rule. Flight planning. Work on the map.

Effects of education - abilities and competences:

Execution of practical navigation tasks, related with planning and realization of journey in chosen environmental and operational conditions.

2. *Satellite navigation systems*

Educational content:

Movement of artificial satellite in terrestrial gravitational field. Orbit – its elements and perturbations. Keller's principles. Positioning of satellite in moment of observation. Global navigation satellite systems - architecture, functions, services, characteristics, signals, techniques and errors of measurements. Fixing receiver's coordinates. Geometric ratios, structure and utilization of receiver. Essence of differential method. Local and regional auxiliary systems. Methods of telemetric transmission. Rescue satellite systems, telecommunication and monitoring – principles of operations, structure, utilization. Techniques of transmission. Bases of exploitations of devices and receivers.

Effects of education - abilities and competences:

Utilizing of receivers of satellite system used in navigation; interpreting of indication and estimates of capabilities of satellite system utilization in respective kinds and phases of navigation.

3. *Safety in navigation*

Educational content:

Basic notions concerning safety. International organizations. Regulations and principles of the safety maintenance. Exchange of information and cooperation in the rescue. Rescue and reporting emergency systems.

Effects of education - abilities and competences:

Adhering of the safety regulations in navigation; use of the appropriate technical systems.

4. *Geographic information systems*

Educational content:

Essence of the GIS. Basic notions, standards and databases GIS(Geographical Information System). Methods of gain and information selection Digitization and qualitative estimate of data. Generalization and visualization. Legal regulations and technical norms. Principles and examples of employment GIS in navigation.

Effects of education - abilities and competences:

Utilizing of GIS systems used in navigation; adhering technical and operational standards, elaborated for the requirements of exchanges and visualization cartographic date.

Specialized Module

1. ***Statistics***

Educational content:

Development tendency for a phenomenon – trends and types. Graphic date presentation data and their utilization. Statistic packages and their utilization. Random variables and their probability distribution. Parameters of distribution random variables. Co-dependence of feature and its measures. Punctual estimation and estimation in intervals. Interval and level of trust. Hypothesis tests. Chosen elements of statistic decisions theories. Variance, correlation and regression analysis.

Effects of education - abilities and competences:

Gaining abilities and competences in range of analysing and interpreting statistic dates; reaching abilities to utilize statistics methods in technique and logistics; ability to conduct descriptive analysis of phenomenon structure; selection and interpretation rate of dynamics of phenomenon; choosing and utilization of mathematical statistics in the statistic deduction; defining of characters and strength of connection between researching random variables; understanding and utilizing elements of statistic decision theories.

2. ***Methods of precision satellite positioning***

Educational content:

Models of mathematical absolute and relative positioning. Differential methods. Techniques of elaboration of kinematic observation GNSS. Date GNSS integration.

Effects of education - abilities and competences:

Knowledge of GNSS positioning methods, their differences and accuracy. Knowledge of expectations of respective methods and sources of errors, which can occur in using particular methods of satellite positioning. Knowledge of principles concerning data exchanges among different horizontal and vertical coordinates systems. Ability of execution of observation, elaboration GNNS satellite data and conducting analyses of obtained results.

3. ***Aeronautical Telecommunication***

Educational content:

Basic issues related with communication and informatics systems. Final and commutation devices. Technical characteristic of digital and analog aeronautical radio stations. Principles and methods of organizational communication. Regulations of conducting radio communications. Safety and protection of communications. Operational documents and secret commanding documents. Using the technical communication means.

Effects of education - abilities and competences:

Ability of utilization technical and tactical capabilities of communication means and systems. Knowledge of regulations in range of the work of technical means of communication; practical using telecommunication and informatics means adhering operational and secret commanding documents.

4. ***Systems of telecasts data in navigation***

Educational content:

Introduction to telecommunication and data telecast. Introduction to Python programming language. Standards of AT modem commands in navigation applications Standards of data formats of satellite navigation systems. Devices and systems of data telecasts. Standards of port communication of navigation devices.

Standards of port communication of data transmission devices. Programing and telecast data of navigation devices. Utilization of data telecast in navigation.

Effects of education - abilities and competences:

Knowledge of principles of operation devices and systems of data telecasts, standards of port communication of navigation devices, standards of data formats of satellite navigation systems, standards of AT modem commands in navigation applications. Knowledge of transmission data control protocols of and states of connections in navigation implementation. Ability of programming and configuring devices (modems GSM/UMTS, radio modems) according to the kind of navigation method, composition of remote transmission navigation data to data servers and creation own navigation data format, objects monitoring. Ability of integration navigation devices and systems and data telecasts systems.

5. ***Real time methods***

Educational content:

GNSS positioning in real time. Code method DGPS. RTK phase method. SBAS- EGNOS/WAAS systems. ASG – EUPOS systems. Real time services Formats of corrections used in real time methods. Reference station GNSS. Configuration of the local reference station DGPS/RTK. Positioning with utilization of manual navigation receivers DGPS. Modem IGTS-R. Accuracy. Positioning with utilization of local baseline station RTK. Positioning RTK with utilization of services ASG - EUPOS. Analysis of accuracy of GNSS positioning in real time.

Effects of education - abilities and competences:

Knowledge of real time DGPS methods used for position fixing, principles of DGPS positioning, principles of EGNOS, RTK positioning. Ability of start-up a local reference DGPS/RTK station, start-up a mobile receiver and determine DGPS and RTC position from local station, utilize of available ASG EUPOS, using IGTS-R modem.

6. ***Programming languages***

Educational content:

Bases of programming and sequences of signs. Bases of operating system Linux. Numbers and programming language operators. Variables, functions, classes and objects of programming languages. Programming of NMEA standard and processing of NMEA sequence with utilization of language programming.

Effects of education - abilities and competences:

Knowledge about bases of programming and data processing. Ability of writing programs for processing different data and variables and programs for recording data in different formats (NMEA, HTML etc.). Abilities to use an operating system Linux and creation of applications in this system. Ability of employment of numbers and programming language operators and variables, functions, classes and objects of programming languages.