Country	Institution	Module Description	ECTS
ROU	**AFAHC**	**Aerial Navigation**	**2.0**

Service	Minimum Qualification for Lecturers
AF	○ English: Common European Framework of Reference for Languages (CEFR) Level B2 or NATO STANAG Level 3. ○ Good knowledge in aerial navigation ○ Theoretical and (not necessary) practical knowledge regarding aerial navigation calculations ○ Adequate knowledge of English radio communications ○ Adequate knowledge regarding flight safety during operational procedures.
Language **English**	

Prerequisites for international participants:	Goal of the Module
• English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. • At least 1 year of national (military) higher education.	– To give basic knowledge to students about navigation systems and radars. – To develop skills for calculations relating to radio navigation systems and radars. – To build competences for analyzing and assessing of navigation information.

Learning outcomes		
	Know-ledge	– The navigation parameters – Fundamental principles of different radio navigation systems – Principles and applications of radio navigation systems during flight and air traffic management – Impact of operating conditions on radio navigation systems – The basic principles and parameters of radars
	Skills	– Work out theoretical performance calculations relating to radio navigation systems – Work out theoretical performance calculations relating to radars – Assess potential decreasing in performances of radio systems related changes of conditions or some parameters
	Responsibility & Autonomy	– Adapting the information to changing environment and changed parameters of systems. – Assessing situation, using data from navigation systems and/or radars – Analyzing information from navigation systems and radars

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Verification of Learning Outcomes	
Test	• A final exam will be given to the cadets for verifying their understanding of the course topics
Assignment	• An individual assignment will be given to the cadets to test their understanding of basic navigation calculations and map reading techniques
Case study	• Some case studies will be discussed in the context of the module regarding map reading and calculation.

Module Details

Main Topic	Recom-mended WH	Details
E-learning	2	• Basic Aerial Navigation refresh • Introduction to Radio Navigation Aids • Basic Radio Propagation Theory • Basic principles.
DME	2	• DME – Distance-measuring equipment • DME – Cockpit displays • DME Arcs
Global Navigation Satellite Systems (GNSS)	4	• Global Positioning System • Global Navigation Satellite Systems • GPS, GLONASS, GALILEO; • Ground, satellite and airborne-based augmentation systems. • Selective Availability • RAIM Capability • RNAV • PBN concept
ADF/NDB navigation system	4	• The NDB and the ADF (Non-directional beacon and Automatic direction finder) • The ADF and the Direction Indicator • The NDB/ADF combination • The ADF cockpit displays • The RMI – Radio Magnetic Indicator • The RBI – Relative Bearing Indicator • NDB Approaches
VOR/DME navigation system	3	• The VOR – Very high frequency Omni-directional Radio range • VOR radials • VOR cockpit instruments • Use of the VOR - Course Intercept • VOR and DME • VOR Instrument Approaches

TACAN	2	• TACAN System • Differences with VOR
Calculations	1	• 60/1 Rule
Instrument Landing Systems	4	• The ILS – Instrument Landing System • ILS elements • ILS cockpit displays • The Glideslope • Marker beacons • HSI – Horizontal situation indicator • Glideslope intercepting
Autonomous Navigation Systems and Area Navigation Systems, RNAV/FMS	2	• General philosophy and definitions; • LORAN , DOPPLER, OMEGA, INS/IRS • Basic RNAV (B-RNAV), Precision RNAV (P-RNAV), RNP-PNAV; • Flight Management System (FMS) and general terms; • Typical flight-deck equipment fitted on FMS aircraft;
Ground Radar	2	• Introduction • Long Range Surveillance Radar • Terminal Surveillance Radar • Surveillance (Approach) Radar
Map reading	4	• FLIP (Flight Information Publications) and Charts
Test	2	• Module examination
Self-Study Hours		
Topic	18	• The self-study hours are required for the preparation of the daily lectures and theoretical exercises • Extra hours are required for the preparation and contribution in the case study of the course regarding different aircraft map situations.
Total WH	**50**	

List of Abbreviations:

CEFR ..... Common European Framework of Reference for Languages

ECTS ..... European Credit Transfer and Accumulation System

NATO ..... North Atlantic Treaty Organisation

STANAG ..... Standardization Agreement

WH ..... Working Hour

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IoT ..... Internetof Things

EU ..... European Union

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