Implementation Group
Doc.: ESDC/2026/112
Date: 18/02/2026
Origin: ESDC Secretariat

Country	Institution	Common Module	ECTS
BG	**NVNA**	**Naval Electronics**	**2.0**

Service(s): **Navy** **Language:** **English**	**Minimum Qualification of Instructors:** • PhD degree in Electrical Engineering • English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2.
SQF MILOF:	• **Competence area** – Military technician. • **Learning area** – Employment of weapon/ operating platform/ systems. • **Organisational level** – Single Arm/Branch.

Prerequisites for participants:	**Contents of the Module:**
• English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. • Minimal knowledge of electronic physics.	• The principles of operation and design of discrete electronic circuits. • Concepts, techniques, visualisation and measurement methods that the electric signals undergo before and after their processing by the electronic circuit. • Basic telecommunications electronic circuits (e.g. amplifiers, filters, oscillators, demodulators), and the undesirable phenomena during signal processing.

Learning outcomes		
	Know-ledge	• Formulate the basics of Message, Electronic Signal, EM signal, Analogue Electronic Components, Circuits and Systems, Basic RF Telecommunication Circuits. • Describe and distinguish the operating principles of the on-board electronic equipment.
	Skills	• Interpret the physic phenomena of electronic devices' functionalities. • Explain measurable parameters, process measurements, and compare theoretical, experimental and simulation results.
	Respon-sibility & Autonomy	• Independently design and analyse discrete and basic RF telecommunication circuits (e.g., amplifiers, filters, oscillators), selecting appropriate passive/active elements and justifying design choices against functional requirements. • Assume responsibility for the correct handling and management of electronic components and circuit assemblies during implementation, measurement, and troubleshooting, ensuring safe/controlled operation and preventing avoidable damage or faults.

Verification of learning outcomes:

- **Observation:** The theoretical part will be uploaded as a prerequisite on the online platform, as well as simulation programs, except ADS, for which a special license will be given.
- **Tests:** The assessment strategy is based on a pre-post assessment method and a personal interview in laboratory premises.
- **Evaluation:** The observation and the practical exercises in the lab result in the overall grading of the module. Qualified individual feedback will be provided to participants.

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Revised by CAPT (N) Nedko Dimitrov / Chairman LoD 2 ..... 01 09 2025
Revised by Col. Catalin Popa / Chairman LoD 11 ..... 03 02 2026
Revised by Col Assoc. Prof. Harald Gell, PhD / Chair IG 04 02 2026
Revised by Assoc. Prof. Nikolaos Karadimas, Chairman LoD-08 ..... 13 02 2026
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Module details:

Main Topic	Recommended WH for the residential phase	Details	
Electronic Signals and Components.	4	• Electronic Signals (Analogue, Digital). • Analogue Electronic Signal (Fourier Transform). • Electronic Components (Laplace Transform).	• Definition of dB, dBm, dBW. • Time Domain and Frequency Domain. • Spectrum.
Passive Filters.	2	• Classification, Transfer Function. • Slope in the cut-off region. • Integrating and Differentiating Circuits.	• Design and Analysis of a Low-Pass, High-Pass, Band-Pass, Band-Rejecting Filter. • Filters of Higher Order.
Power Supplies.	4	• Semiconductor diodes. • Zener. • Rectifiers, Simple – Full rectification.	• Smoothing circuits (Filters C, Π and L). • Stabilisation.
Transistors and Amplifiers.	4	• Bipolar Junction Transistor. • Analysis of Operations, Static Characteristics. • BJT Amplifiers, DC analysis.	• Matching and Bias circuits. • 2-port Equivalent Hybrid Circuits, Frequency Response (AC analysis).
Active Filters.	2	• Operational amplifiers, Active Filters. Circuits with Operational Amplifiers (Adder, Multiplier, Integrator, Differentiator).	
Distortion, Noise, Feedback and Applications.	4	• Non-Linear Phenomena, Distortion in Amplifiers. • Feedback and Applications. Negative Feedback and Applications in Electronic Circuits.	• Oscillators. • Mixers. • Noise Figure, Receivers.
Tutorials – laboratory practice	1	• Passive Filters construction and measures	• Simulation.
	1	• Power Supplier design, construction, measurement, and simulation.	
	1	• Active Filter design and construction. • Theoretical Analysis and Simulation results.	• Comparison between theory, experiment, and simulation.
	1	• BJT amplifier design, construction, and experimental results. • Simulation (DC and AC analysis). • Identification of non-linear phenomena, feedback response, and report.	
Total WH (contact hours)	**20+4**		
Additional hours (WH) to increase and assess the learning outcomes (during residential phase):			
Self-studies	25	• The rules and regulations for NATO military equipment and weaponry systems operation.	
Test / evaluation / assessment	1	• Theoretical and practical Assessment	
Total WH	**50**	The detailed amount of hours for the respective main topic is up to the course director according to national law or the home institution's rules.	

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List of Abbreviations:

ADS ..... Advanced Design System Simulator
B1, B2, C1 ..... CEFR Levels
BG ..... Republic of Bulgaria
BIP ..... Blended Intensive Programme
CEFR ..... Common European Framework of Reference for Languages
ECTS ..... European Credit Transfer and Accumulation System
ESDC ..... European Security and Defence College
GMDSS ..... Global Maritime Distress and Safety System
IG ..... Implementation Group
NATO ..... North Atlantic Treaty Organization
NVNA ..... Nikola Vaptsarov Naval Academy
SOLAS ..... Safety of Life at Seas
STANAG ..... Standardisation Agreement
STCW ..... Standards of Training Certification and Watchkeeping
WH ..... Working Hour (60 minutes)
IMO ..... International Maritime Organisation

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