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| **Country**  **GR** | **Institution**  **HNA** | **Course title:**  **NAVAL ELECTRONICS** | **ECTS**  **2** |

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| Service  **Navy** | **Minimum Qualification for Lecturers**   * PhD degree in Electrical Engineering * English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. | |
| Languages  **English** |
| **Prerequisites for international participants:**   * English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. * Minimal knowledge of electronic physics | | **Goal of the Module:**   * Understand the principles of operation and design of discrete electronic circuits * Familiarize with the concepts, the techniques, the visualization and measurement methods that the electric signals undergo before and after their processing by the electronic circuit * Acquire the necessary knowledge on basic telecommunications electronic circuits (eg amplifiers, filters, oscillators, demodulators), explain and correct the undesirable phenomena during signal processing |

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| Learning outcomes | Knowledge | * Acquire the scientific knowledge, necessary for understanding the operating principles of the on-board electronic equipment: Message, Electronic Signal, EM signal, Analog Electronic Components, Circuits and Systems, Basic RF Telecommunication Circuits, via theoretical and laboratory training. |
| **Skills** | * Interpret the physic phenomena of electronic devices functionalities. * Explain measurable parameters and quickly resolve undesirable phenomena that occur during observations * Ηave abilities in implementing electronic circuits, acquiring and processing measurements and comparing theoretical, experimental and simulation results. |
| **Competence** | * Ability to understand, design and analyse electronic circuits making use of different types of passive and active elements. * Ability to understand and analyse the power supply of electronic circuits. * Ability to analyse and understand the RF behavior of electronic circuits. * Ability to analyse and understand the behavior of electronic circuits either in time or frequency domain |

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| **Verification of learning outcomes** |
| * **Observation**:   + The theoretical part will be uploaded as prerequisite on eclass.hna.gr platform, as well as simulation programs except ADS for which a special license will be given. * **Tests**:   + The assessment strategy is based on 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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| **Module details** | | |
| **Main Topic** | **Reco-mmended**  **WH** | **Details** |
| Electronic Signals and Components | 5 | * Electronic Signals (Analog, Digital) * Analog Electronic Signal (Fourier Transform) * Electronic Components (Laplace Transform) * Definition of dB, dBm, dBW * Time Domain and Frequency Domain * Spectrum |
| Passive Filters | 3 | * 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 |
| Laboratory 1 | 2 | * Passive Filters construction and measures * Simulation |
| Power Supplies | 4 | * Semiconductor diodes * Zener * Rectifiers, Simple – Full rectification, * Smoothing circuits (Filters C, Π and L) * Stabilization |
| Laboratory 2 | 2 | * Power Supplier design, construction, measurement and simulation |
| Transistors and Amplifiers | 4 | * Bipolar Junction Transistor * Analysis of Operation, Static Characteristics. * BJT Amplifiers, DC analysis * Matching and Bias circuits, * 2-port Equivalent Hybrid Circuits, Frequency Response (AC analysis) |
| Active Filters | 2 | * Operational Amplifier, Active Filters. Circuits with Operational Amplifier (Adder, Multiplier, Integrator, Differentiator) |
| Laboratory 3 | 2 | * Active Filter design and construction * Theoretical Analysis and Simulation results * Comparison between theory, experiment and simulation |
| Distortion, Noise, Feedback and Applications | 2 | * Non-Linear Phenomena, Distortion in Amplifiers * Feedback and Applications. Negative Feedback and Applications in electronic circuits. * Oscillators * Mixers * Noise Figure, Receivers |
| Laboratory 4 | 2 | * BJT amplifier design, construction, and experimental results * Simulation (DC and AC analysis) * Identification of non-linear phenomena, feedback response, report |
| Final evaluation | 2 | Pre-Post Assessment and Laboratory evaluation |
| **Total lecture WH** | **30** |  |

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| **Additional hours (WH) to increase the learning outcomes (4 ECTS total)** | | |
| Power Electronics | 2 | * Power Control Electronic devices * UniJunction Transistor, Thyristor, Diac, Triac * Applications to the control of the mean current without losses (control circuits). |
| Digital Circuits | 8 | * Combinational Digital Circuits * Sequential Digital Circuits |
| Laboratory 5 | 4 | * Combinational Circuit design and construction * Digital Counter |
| Microwave Integrated Circuits | 6 | * Microwave Filters * Microwave Amplifiers |
| Laboratory 6 | 5 | * Advanced Design System: Power Amplifier, Low Noise Amplifier, Microwave Filters |
| IMO, SOLAS and Introduction to the Global Maritime Distress and Safety System | 4 | * From Medium Frequency Morse signals to High Frequency communications * INMARSAT, NAVTEX, EPIRB, DSC, AIS, SART, Cospas-Sarsat and frequency allocation * GMDSS areas * STCW standards |
| Evaluation | 1 | * Final Assessment |
| **Total WH** | **60** | 30 residential hrs (20 teaching hrs + 8 practical exercises + 2 final assessment); or 60 residential hrs (40 teaching hrs + 17 practical exercises + 3 final assessment) |

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| **List of Abbreviations:** |
| GR…………………………………………………………...…………...……………………Greece  HNA…………….………………………………………………………… Hellenic Naval Academy  CEFR…………………………..……. Common European Framework of Reference for Languages  B2………………………………….……………………………………. Common Reference Levels  ECTS…………………………………………. European Credit Transfer and Accumulation System  NATO……………………………………………………………North Atlantic Treaty Organisation  STANAG……………………...………………………………………... Standardization Agreement  WH…………………………...………………………………………………………. Working Hour  ADS……….…………………………………………………… Advanced Design System Simulator  ΙΜΟ…………………………………………………………..…International Maritime Organisation  SOLAS…………………………………………………………….……………Safety of Life at Seas  GMDSS……………………..…………………………Global Maritime Distress and Safety System  STCW……………………………………….Standards of Training Certification and Watchkeeping |