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| **Country****ITA** | **Institution****Naval Academy** | **Course title:****NAVAL POWER PLANTS**  | **ECTS****2** |

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| Service**Navy**  | **Minimum Qualification for Lecturers*** PhD degree in Naval Engineering
* English: Common European Framework of Reference for Languages (CEFR) Level B2 or NATO STANAG Level 2+.
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| Languages**English** |
| **Prerequisites for international participants:*** English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2.
 | **Goal of the Module:*** Understand the principles of operation and design of a propulsion systems
* Identify the main components of a marine power plant and propulsion system
* Understand the performance and limitations of a marine power plant
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| Learning outcomes | Knowledge | * Basic knowledge of Fluid and Gas Dynamics.
* Knowledge of different types of engines and thrusters.
* Discern and describe the processes, elements and performance of marine propulsion systems.
* Analyze and describe the function of system pipeline and equipment necessary for safe navigation.
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| **Skills** | * Ability to analyze ship propulsion systems on different types of ships
* Ability to layout the different systems on board
* Ability to manage different types of engines, propellers (F.P. – C.P.P.).
* Ability to calculate engines fuel consumption per hour for different speeds.
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| **Competence** | * Manage propulsion plants in different scenarios.
* Manage propulsion plants to obtain the best performance in relation with the mission.
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| **Verification of learning outcomes** |
| * **Observation**:
* Class time is primarily assigned to lecturing. Educational materials such as slides or videos may be used in order to illustrate some of the basic points in the lecture in order to encourage discussions and debates about focus points.
* Methods of teaching/lecturing are: lecturing, heuristic conversation, explanation, discussions/debates, case study, simulation of situations.
* **Tests**:

Final exam (written test).* **Evaluation**:
	+ The final exam will consist in examination based on a multiple-choice test and applications of the taught subject.
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| **Module details** |
| **Main Topic** | **Reco-mmended** **WH** | **Details** |
| Ship propulsion systems | 6 | * Layout, Engines, Gears, Bearings, Seals, Shafts, Propeller, Diesel- Electric systems, Auxiliary systems
* Terminology and definitions for main ship propulsion systems
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| Thermodynamics of combustion engines | 6 | * Ideal Thermodynamic Cycles and Actual Cycles (Rankine, Brayton, Diesel)
* Calculation and measurement methods for engine power output, fuel consumption, heat exchange, temperatures, pressures, flows, speed, exhaust gas composition
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| Combined Propulsion Plants | 6 | * General overview: Gas turbines. Electric motors. 2 stroke and 4 stroke Diesel engines. Nomenclature. Layout.
* Redundancy and down-graded conduct
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| Safety and Enviromental | 5 | * Safety in Engine Room (fire hazard, crankcase explosion)
* Marine fuels and emissions
* Exhaust emissions
* Energy Efficiency
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| Final evaluation | 2 | Pre-Post Assessment evaluation |
| **Total lecture WH** | **23** |  |

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| **List of Abbreviations:** |
| ITA…………………………………………………………...…………...…………………… ItalyCEFR…………………………..……. Common European Framework of Reference for LanguagesB2………………………………….……………………………………. Common Reference LevelsECTS…………………………………………. European Credit Transfer and Accumulation SystemNATO……………………………………………………………North Atlantic Treaty OrganisationSTANAG……………………...………………………………………... Standardization AgreementWH…………………………...………………………………………………………. Working Hour |