1. Curriculum Number: 525

2. Curriculum taught at Naval Postgraduate School

3. Curriculum Length in Months: 24 months

4. APC Required: 323

5. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Undersea Warfare (USW) within the Department of the Navy (DoN) and the DoD including:

**ESR-1: Mathematics:** The officer will master the mathematical principles and techniques necessary to complete graduate level coursework and research related to undersea warfare.

**ESR-2: Physics:** The officer will understand physical principles applicable to acoustic, non-acoustic USW sensors and systems.

**ESR-3: Acoustics:** The officer will understand acoustical phenomena affecting the design, performance, and operation of acoustic USW sensors and systems.

**ESR-4: Oceanography:** The officer will understand atmospheric and oceanographic processes influencing the performance and tactical use of USW systems.

**ESR-5: Signal Processing:** The officer will understand fundamental principles of signal processing as they apply to USW systems.

**ESR-6: Operations Research:** The officer will understand the principles of USW search, detection, and localization, particularly in support of operational planning. The officer will understand principles of tactical decision aids and data analysis in the evaluation of USW systems.

**ESR-7: Unmanned Systems:** The officer will understand the fundamental technologies and capabilities of unmanned underwater systems and robotic technologies. This will include a physical understanding of autonomous and remotely operated current and future technologies as well as concepts and limitations for unmanned systems as a part of future undersea operating concepts.

**ESR-8: Joint Professional Military Education:** Graduates will complete the Navy Joint Professional Military Education Phase I requirements. Additionally, they will understand the history of USW and its implications to today's Navy.
ESR-9: **Programming and Simulation**: The officer will be able to program solutions to essential engineering problems. The officer will be able to assess models and perform simulations.

ESR-10: **Problem Solving and Practical Applicability**: The officer will demonstrate the ability to conduct independent analysis in USW and proficiency in written and oral presentations.

6. **Major Area Sponsor and Subject Matter Experts**

   a. **Major Area Sponsor**: RADM Michael C. Manazir, Deputy Chief of Naval Operations for Warfare Systems (OPNAV N9)

   b. **Subject Matter Expert**: RADM Charles A. Richard, Director, Undersea Warfare Division (OPNAV N97)

   ![Signature]

   **APPROVED: [Signature]**
   Director, OPNAV N9
   29 Aug 16
   [DATE]

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   **APPROVED: [Signature]**
   President, Naval Postgraduate School
   MAR 1 0 2017
   [DATE]

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   **APPROVED: [Signature]**
   Director, OPNAV N12
   31 March 2017
   [DATE]