NATO MARITIME GEOSPATIAL, METEOROLOGICAL & OCEANOGRAPHIC CENTRE OF EXCELLENCE

Our Reference	NU/MGEOMETOC COE/005
Date	24 February 2026
To	ALL COURSE PARTICIPANTS & INSTRUCTORS
Subject	**MILITARY OCEANOGRAPHY (MILOC) COURSE JOINING INSTRUCTIONS (JIs)**
Reference	CALLING NOTICE FOR THE FIRST EDITION OF THE MILOC COURSE, 16-20 MARCH 2026, dated 16 JAN 25
Enclosures	A. Course Programme B. Discounted Accommodation Options

Introduction

1. Welcome to the **INT-MO-37241 Military Oceanography Course** for 2026. We are pleased to confirm your participation and provide the joining instructions for the course.
2. This pilot course will be held in person at the NATO Maritime Geospatial, Meteorological & Oceanographic Centre of Excellence (Maritime GEOMETOC COE) premises in Lisbon, Portugal, from 16 to 20 March 2026, on behalf of the NATO Military Oceanography Technical Panel (MILOC).

   Venue Address: Rua das Trinas 49, 1249-093 Lisbon, Portugal (Co-located with Portuguese Hydrographic Institute (IHPT)).
3. This one-week course will be delivered by Subject Matter Experts from across NATO, including (CAN, GBR, NLD, TUR and USA) and the Maritime GEOMETOC COE along with other invited guest speakers and will consist of interactive lectures and some practical exercises covering the topics outlined in the course programme provided in Enclosure A.
4. The course is heavily oversubscribed. **Students who are unable to attend are to notify us no later than 06 MAR 26**, so that your place can be offered to another nation. Notifications are to be sent info@mgeometoccoe.org

Schedule & Logistics

5. Students reception on Monday, 16 March, from 08:00 to 08:25.

6. The course will run from Monday, 16 March, to Friday, 20 March 2026. Daily sessions are scheduled from 08:30 to 17:00 (subject to adjustments), except on Friday, the course will conclude at 15:00.
7. Lunches will be provided at the IHPT Military Mess. Morning and afternoon coffee breaks will be made available in proximity to the classroom.
8. Military accommodation is not available. Participants are advised to consider the discounted accommodation options listed in Enclosure B.
9. All students are required to bring their national Identity card and / or passports, for security checks upon arrival. The course will be conducted at NATO UNCLASSIFIED level; therefore, personal or military laptops and mobile phones are permitted. Wi-Fi access is available on site.

Course Fee and Payment Instructions

10. The **course fee is €200 per student** and includes lunches, the ice-breaker event, and refreshments throughout the course. Please note that the course fee does not apply to instructors.
11. Payment must be made only by **bank transfer no later than 07 working days before the course starts**. All bank charges associated with the payment are the responsibility of the students or respective organizations. Students are recommended to check the total payment amount to avoid any discrepancies or underpayment. Proof of payment must be sent to info@mgeometoccoe.org.

    The MARITIME GEOMETOC COE account details:

    Banco Santander Totta S.A.
    BIC/SWIFT**:** TOTAPTPL
    IBAN: PT50 0018 0003 5297 7899 020 22
    Portugal

Dress Code

12. Due to the location within central Lisbon and limited changing areas, students will wear business casual. Business casual is comprised of a sleeved shirt with trousers, with or without jacket and tie, with equivalent attire for ladies. Jeans, T-shirts, shorts, flip flops/sandals are not acceptable.

Social Programme

13. While your free time is your own, we've organized a casual **ice-breaker event on Monday evening at the same location as the course**. We hope you'll be able to join us - please let us know if you are unable to attend.

Transportation

14. Lisbon, the capital of Portugal, is located on the western Iberian Peninsula, near the Atlantic Ocean and the River Tagus.

    a. Getting to Lisbon by Air

    The recommended airport is Lisbon Humberto Delgado Airport, located approximately 5 km from the city centre (about 20 minutes). For more information, visit Lisbon Airport Website.

    Upon arrival, you can easily reach the city center by taxi, metro, or bus. Lisbon has an efficient public transport network that ensures quick and comfortable travel to and from the airport. For details on public transport, visit Public Transportation Information.

    b. Travel by Taxi

    Taking a taxi is often the quickest and most comfortable option. The fare from the airport to the city center is approximately €15 - €20, depending on traffic and whether the €5 airport tax is applied (some taxi drivers may not charge it).

    c. Travel by Public Transport

    Lisbon's public transport system is operated by Carris-Metro. Tickets can be purchased for each journey on buses, trams, or at metro stations. However, the most cost-effective way to travel is by purchased tickets in advance and loaded on support cards. For more information: Bus: https://www.carris.pt/en/ | Train: Comboios de Portugal | Metro: https://www.metrolisboa.pt/en/

    Students should consider using google maps or similar travel applications to assist with travel.

    d. Additional information

    Students will be released at 1500 on Friday 06 March 2026 to return to their units. It is recommended that students do not arrange flights until at least 1700 from Lisbon Airport.

    There is no car parking at the IHPT, therefore students should not bring rental cars to the IHPT. Bolt and Uber taxi apps are widely used in Lisbon and are considered very cheap.

Points of Contact for the course are:

The MILOC Vice Chair Mr Martin Taillefer (CIV) CAN-N, Martin.Taillefer2@forces.gc.ca

The MILOC Secretary Lt Cdr Jim Bridge (OF-3) GBR-N, james.bridge@nato.int

Maritime GEOMETOC COE, info@mgeometoccoe.org

ENCLOSURE A
DATED 24 FEB 26

COURSE PROGRAMME FOR THE MILITARY OCEANOGRAPHY COURSE

1. Course Introduction
Program Intro, Welcoming Remarks, Future of MILOC & Opinion

2. Physical Oceanography for Naval Operations
Ocean stratification (mixed layer, thermocline, deep layer)
Temperature, salinity, and density impacts on sound propagation
Internal waves and fronts, thermal haline circulation
Tides, currents, and eddies affecting ship and asset movement
Ocean Thermal Structure, Wind Mixing, Upper mixed layers, afternoon effects

3. Acoustic Oceanography (Underwater Sound)
Ocean acoustics fundamentals: sound speed, propagation, ducting, convergence zones
Bathymetry and bottom composition and propagation impacts
Bottom and surface interactions (reverberation, scattering)
Sound tendencies, sound speed gradients
General sound propagation theory
Acoustic Refraction
Under the hood of sound: Cut-off frequencies, doppler, snell's law, calculating decibels
The changing soundscape as a submarine transits across a region
Sound speed profiles (SSP) and tactical implications
Ambient noise (biological, shipping, wind, ice, seismic)
Sound propagation implications, shadow zones

4. Ocean Modelling
Shallow water & ASW Implications
Sonic Layer Depth and SSP structure
Upslope / Downslope Enhancement, Topographic Shading, Bathymetric Shadow Zones
Transmission loss
Absorption/Scattering
Tactical acoustic modelling in an ASW
SONAR Equation
Development of acoustic modelling and propagation
Range dependance vs Range independent propagation schemes
General Acoustic Modelling theory
Ocean modeling and forecast products: model types, strengths, limitations
Geometric sound spreading and examples

5. Oceanographic Impacts on Anti-Submarine Warfare (ASW)
Detection ranges and sonar performance prediction
Tactical implications for ASW, sonar performance, weapon/sensor effectiveness
Sensor Placement
Understanding Tactical Decision Aids (TDAs) for ASW planning
Submarine’s Best Depth to Avoid Detection
Calculating a submarines range, depths and bearings
Influence of bathymetry, seabed type, and sediment
Convergence zone exploitation, bottom bounce, and surface ducting
Environmental challenges for naval operations (ASW, surface, SAR, comms)
Definitions of shallow water and impacts

Tactical Decision Aids (TDAs) and sonar employment optimization
Examination of a tactical scenario
In-tempo modelling / mini tactical gaming for decision making
Definitions of Littoral battlespace

6. Environmental Awareness and Battlespace Characterization
Recognition of tactical opportunities (environmental advantage)
Environmental Battlespace Awareness (EBA) and its relevance to military operations
Maritime Environmental Threat and Opportunity Recognition
ASW Tactics vs Tactical Oceanography Operational Oceanography Intelligence (OPINTEL)

7. Sensor, Platform, and Weapon Oceanographic Impacts
SONAR Equations
Passive Sonars
Active Sonars
Ocean effects on mine warfare and seabed operations
Future capabilities – AI modeling, autonomous sensing, data fusion
Mine warfare considerations: seabed characterization, bottom type, water clarity

8. Military Oceanography & METOC Support
Planning METOC support to a NATO maritime operation (e.g., SNMG, JTF)
NATO data sharing, reporting formats, and collaborative workflows
METOC support to underwater operations (submarines, UUVs, sonobuoys)
Environmental information as operational intelligence
Decision support tools: METOC DSS, NATO recognized environmental picture
METOC support to Joint Operations Planning: integrating into J3/J5
METOC Support to Maritime Domain Awareness

9. Modelling, Forecasting, and Decision Support Tools
Use of Tactical Decision Aids (TDAs) for mission planning
Data sources: satellite, in situ, gliders, buoys, ARGO floats
Probabilistic forecasting and risk assessment (Monte Carlo, ensembles)
Ocean and acoustic prediction systems (COAMPS, NCOM, HYCOM)
Data Collection, Data Integration and data modelling

10. Polar and Littoral Oceanography
Arctic oceanography (ice edge acoustics, under-ice operations)
Shallow water acoustics and coastal complexity
Environmental challenges in choke points, fjords, archipelagos
Arctic oceanography: ice types, marginal ice zone, thermohaline layering
Littoral oceanography: sediment, turbidity, current dynamics, tides, river plumes
Sediment transport, turbidity, and biofouling effects

11. Marine Mammal and Environmental Protection
Marine Mammal Mitigation and legal obligations
Acoustic safety zones and environmental operating constraints
Use of environmental compliance tools during operations
Tactical Application of Bioluminescence

ENCLOSURE B
DATED 24 FEB 26

MARITIME GEOMETOC COE DISCOUNTED ACCOMMODATION OPTIONS

Participants are encouraged to book early to ensure availability. Please don't hesitate to contact us if you need any assistance.

Hotel São Bento (3★)

- Rate: 90 EUR per night
- Distance: 15-minute walk from the COE
- Address: Rua de São Bento, 347, 1269-084 Lisbon, Portugal
- Reservations:
  Tel: +351 213 979 020
  Email: reservas@lisbonsaobentohotel.pt
  https://www.lisbonsaobentohotel.pt/EN/hotel.html

Centro de Apoio Social de Oeiras (CAS Oeiras) | Instituto de Ação Social das Forças Armadas (IASFA)

Military Social Support Centre offering temporary accommodation.
This facility offers affordable, short-term accommodation, primarily intended for members and affiliates of the Armed Forces.

- Rate: From 40 EUR onwards per night
- Distance: Approximately 40 minutes by train from the COE
- Address: Rua Dom Duarte 2, 2780-064 Oeiras, Portugal
- Please Note: The IASFA does not maintain an English- language website, which may make access to information or reservation details challenging for international participants.
- Reservations:
  Phone: +351 214 430 830
  Email: casoeiras@iasfa.pt

Other Options:

York House Hotel (4★)

- Rate: 161 EUR per night
- Distance: 5-minute walk from the COE (closest hotel to COE aside from Airbnb's and hostels)
- Considered a high-end hotel
- Address: Rua das Janelas Verdes 32, 1200-691 Lisbon, Portugal
- Reservations:
  Phone: +351 213 962 435
  Email: yorkhouse@yorkhouselisboa.com
  Website: https://www.yorkhouselisboa.com/pt/index.html

Janelas Verdes Hotel (4★)

- Rate: 152 EUR per night
- Distance: 10-minute walk from the COE
- Also considered a high-end hotel
- Address: Rua das Janelas Verdes 47, 1200-690 Lisbon, Portugal
- Reservations:
  Phone: +351 213 932 396
  Email: reservas@heritage.pt