INT-MO-37241 MILITARY OCEANOGRAPHY COURSE
2026 EDITION – COURSE SCHEDULE

Dates	**16-20 MAR 2026**	**Course Director**	**Mr. Martin Taillefer, CAN, martin.taillefer2@forces.gc.ca**
Location	**MARITIME GEOMETOC COE** Scientific Council Room	**Course Officer of Primary Responsibility (OPR)**	LCDR Sónia Godinho (OF-3), PRT N, sonia.godinho@mgeometoccoe.org
Security Clearance	NU: NATO UNCLASSIFIED	**Course Point of Contact**	LTJG Mauro Silva (OF-1), PRT N, mauro.silva@mgeometoccoe.org
NATO Course Certification	Listed	**Information**	The course schedule may be subject to change due to adjustments in the program or instructor's availability.

	MONDAY, 16 MAR	TUESDAY, 17 MAR	WEDNESDAY, 18 MAR	THURSDAY, 19 MAR	FRIDAY, 20 MAR
08:00 – 08:30	Student Reception Meeting point: Scientific Council Room				
08.30 - 08.45		Students Reception	Students Reception	Students Reception	Students Reception
08:45 - 9:30	**Lecture 0** - Course Overview and Administrative Remarks - Introductions (Name, Country, Uni/Role, Background experience)	**Lecture 4** – Acoustic Oceanography (Part 1)	**Lecture 8** - Oceanographic Impacts on Anti-Submarine Warfare (Part 1)	**Lecture 11** - Sensor, Platform, and Weapon Oceanographic Impacts	**Lecture 14** – Modelling, Forecasting, and Decision Support Tools
09:30-10:15	*** WHAT IS NATO** (Bridge) *** COURSE OBJECTIVES** (Taillefer)				
10:15 - 10:30	BREAK				
10:30 - 11:15	**Introduction to the NATO Maritime GEOMETOC COE** – CDR Gustavo Crespo **Course Photography**	**Lecture 5** – Acoustic Oceanography (Part 2)	**Lecture 8** - Oceanographic Impacts on Anti-Submarine Warfare (Part 1)	**Lecture 11** - Sensor, Platform, and Weapon Oceanographic Impacts	**Lecture 15** – Polar and Littoral Oceanography
11:15-12:00	**Lecture 1** – Physical Oceanography for Naval Operations				
12:00 – 13:00	LUNCH BREAK				
13:00 - 13:45	**Lecture 1** – Physical Oceanography for Naval Operations	**Lecture 6** – Basic Ocean Acoustics Modelling	**Lecture 9** - Oceanographic Impacts on Anti-Submarine Warfare (Part 2)	**Lecture 12** - Military Oceanography & NATO METOC Support	**Lecture 16** – METOC Support
13:45-14:30	**Lecture 2** - Ambient Noise				
14:30-14:45	BREAK				**COURSE SURVEY & FEEDBACK Certificates Delivery & Course Director farewell**
14:45-15:30	**Lecture 2** - Ambient Noise	**Lecture 7** – Advanced Tactical Modelling	**Lecture 10** - Environmental Awareness and Battlespace Characterization	**Lecture 13** – Marine Mammal and Environmental Protection	
15:30- 16:15	**Lecture 3** – Sound Speed Profiles & Ray Paths				**Course ends between 15:00 and 15:30**
16:15 - 17:00					
17:00	**Ice breaker event**				

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Lecture	Details	Lecturer
Lecture 0 – Workshop / Course Intro	Program Intro, Welcoming Remarks, Future of MILOC & Opinion Introduction to the Littoral Battlespace. What is NATO / Course Objectives	**Mr. Martin Taillefer,** Chief Oceanographer, CAN **LCDR Jim Bridge, UK** METOC Staff Officer (Training, Exercises & Maritime Support) SHAPE
Lecture 1 - 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	**Lt Tristan Balcombe** RN, METOC Staff Officer Joint Force Command Naples
Lecture 2 – Ambient Noise	Biological, shipping, wind, ice, seismic	**Dr. Serdar Tombul, Captain** Turkey (OF-5), Concept Development & Experimentation Branch Head, NATO Maritime GEOMETOC Centre of Excellence
Lecture 3 - Sound speed Profiles & Ray Paths	Sound propagation implications, shadow zones Sound speed profiles (SSP) and tactical implications The changing sound scape as a submarine transits across a region	**Lt Cdr Marc Hovenier,** METOC & Underwater Warfare Specialist Royal Netherland Navy / NATO
Lecture 4 - Acoustic Oceanography (Part 1)	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	**Lt Tristan Balcombe** RN, METOC Staff Officer Joint Force Command Naples **Lt Cdr Marc Hovenier,** METOC & Underwater Warfare Specialist Royal Netherland Navy / NATO
Lecture 5 - Acoustic Oceanography (Part 2)	Shallow water & ASW Implications Sonic Layer Depth and SSP structure Upslope / Downslope Enhancement, Topographic Shading, Bathymetric Shadow Zones Transmission loss Absorption/Scattering	**Lt Tristan Balcombe** RN, METOC Staff Officer Joint Force Command Naples
Lecture 6 - Basic Ocean Modelling	Tactical acoustic modelling in an ASW Development of acoustic modelling and propgation Range dependance vs Range independant propgation schemes General Acoustic Modelling theory Ocean modeling and forecast products: model types, strengths, limitations Geometric sound spreading and examples	**Mr. Martin Taillefer,** Chief Oceanographer, CAN

Lecture 7 - Advanced Tactical Modelling	Examination of a tactical scenario In-tempo modelling / mini tactical gaming for decision making Topographical noise stripping - hostile sub pathways Tactical Application of Bioluminescence	**Mr. Martin Taillefer,** Chief Oceanographer, CAN **Mr. Dan W. Lawrence** Distinguished Practitioner in Undersea Warfare Tactical Decision Aids & Acoustic Analysis
Lecture 8 - Oceanographic Impacts on Anti-Submarine Warfare (Part 1)	Sonar Equation Detection ranges and sonar performance prediction Convergence zone exploitation, bottom bounce, and surface ducting Environmental challenges for naval operations (ASW, surface, SAR, comms) Definitions of shallow water and impacts Understanding Tactical Decision Aids (TDAs) for ASW planning Tactical Decision Aids (TDAs) and sonar employment optimization	**Lt. Alexendra Steeples** MetOc Information Warfare Group
Lecture 9 - Oceanographic Impacts on Anti-Submarine Warfare (Part 2)	Tactical implications for ASW, sonar performance, weapon/sensor effectiveness Sensor Placement Submarine's Best Depth to Avoid Detection Calculating a submarines range, depths and bearings Influence of bathymetry, seabed type, and sediment	**Lt. Alexendra Steeples** MetOc Information Warfare Group
Lecture 10 - 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) Steps to Tactical Oceanographic Analysis Ocean feature forecasting (eddies, fronts, ice, salinity layers)	**Mr. Dan W. Lawrence** Distinguished Practitioner in Undersea Warfare Tactical Decision Aids & Acoustic Analysis **Mr. Martin Taillefer,** Chief Oceanographer, CAN
Lecture 11 - Sensor, Platform, and Weapon Oceanographic Impacts	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	**LCDR Jim Bridge, UK** METOC Staff Officer (Training, Exercises & Maritime Support) SHAPE **Lt. Alexendra Steeples** MetOc Information Warfare Group
Lecture 12 - Military Oceanography & NATO METOC Support	Planning METOC support to a NATO maritime operation (e.g., SNMG, JTF) NATO data sharing, reporting formats, and collaborative workflows	**LCDR Jim Bridge, UK** METOC Staff Officer (Training, Exercises & Maritime Support) SHAPE
Lecture 13 - 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 Bioluminescence	**Dr. Benjamin Colbert** Marine Resources and Ocean Acoustics Lead, OPNAV (N4I1)

Lecture 14 – 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	**Ryan K. Vaughan**, AG1 (IW/EXW/SW/AW) Commander, Task Force 69 Naples, Italy
Lecture 15 - 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	**Ryan K. Vaughan**, AG1 (IW/EXW/SW/AW) Commander, Task Force 69 Naples, Italy
Lecture 16 - METOC Support	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	**Ryan K. Vaughan**, AG1 (IW/EXW/SW/AW) Commander, Task Force 69 Naples, Italy