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| IALA Model Course |

Cnnnn

Model Course title

Edition x.x

Date (of approval by Council)

urn:mrn:iala:pub:cnnnn

Revisions to this document are to be noted in the table prior to the issue of a revised document.

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# introduction

The International Organization for Marine Aids to Navigation (IALA) recognises that training in all aspects of the management of Marine Aids to Navigation (AtoN) service delivery is critical to the consistent provision of that AtoN service.

Taking into account that under the SOLAS Convention, Chapter V, Regulation 13, paragraph 2, published by the International Maritime Organization (IMO), Contracting Governments, mindful of their obligations, undertake to consider the international recommendations and guidelines when establishing marine aids to navigation, including recommendations on training and qualification of AtoN managers, IALA has published IALA Standard *1050* *Training and Certification* and adopted Recommendation *R0141 Standards for Training and Certification of AtoN personnel*.

IALA Committees working closely with the IALA World-Wide Academy (the Academy) have developed a series of model courses. This model course is intended to provide national members and other appropriate authorities charged with the provision of AtoN services with specific guidance on the acquisition, management, quality assurance, statistical analysis, and strategic application of AIS data to support maritime safety, security, environmental protection, traffic management, and policy development.

It is intended to be delivered primarily by the Academy, with the support of dedicated experts participating in the IALA Committees, particularly those specializing in AIS data management and operational matters.

Assistance in implementing this and other model courses may be obtained from the IALA World-Wide Academy.

# Course Overview

## Purpose and scope

The purpose of this model course is to….

The model course covers….. It specifically does not cover….

## Framework

The course comprises e.g., modules, exercises, presentations etc. running for a duration of 5 days. The content will relate to the competencies and learning objectives defined by the WWA and incorporated into the relevant tables in the Modules sections of this document. It will be delivered by either WWA or competent authority representative, experts in the field and assessed using e.g., exam, presentation, exercise etc.

It has been agreed during IALA Committee sessions that training should be adaptable to the background, roles, and responsibilities of the participants. To accommodate these varying needs, the course may be structured into two complementary modules:

1. AIS Data Management and Processing, focusing on data acquisition, validation, storage, and analysis; and



(2) AIS Data Utilization for Maritime Navigation and Safety, concentrating on the practical application of AIS data in navigation, risk assessment, and decision-making processes.



The diagrams below illustrate how the modules and competencies are divided according to the targeted audience described above. This structure allows the course content to be tailored to participants’ specific backgrounds and responsibilities, ensuring that each group receives training most relevant to their role—whether in AIS data management and processing or in the practical utilization of AIS data for maritime navigation and safety:

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## Course certificate

Upon successful completion of the course and assessments, a certificate is issued indicating the holder has completed a training course that meets or exceeds the level of knowledge and competence specified in this course model and in the IALA competency framework.

A certificate may be issued only by accredited training organization.

## Staff requirements

Instructors shall possess the necessary training in instructional techniques and training methodologies, as well as be qualified for the task for which training is being conducted.

Or

Course tutors should meet at least three of the following criteria.

* Fluency in English or other approved main language of instruction;
* Be in possession of (e.g., certificate) and at least x years’ (kind of experience) experience in AtoN service provision;
* At least X years’ work experience with a recognised AtoN service provider or IALA Industrial Member in an X (e.g. senior management) capacity;
* Lecturing experience at a recognised nautical or engineering higher education establishment;
* Proven professional or technical expertise in a specialist field related to syllabus competencies (for example…..).

## Course assessors

Course assessors should have the required competency as a tutor and meet at least one of the following criteria.

* e.g., At least 4 years’ experience as ….
* e.g., Chair or Vice-Chair of an IALA Technical Committee.

## Teaching facilities and equipement

A classroom that has an overhead projector, a whiteboard, a blackboard, an interactive board, or a flipchart should be available for group discussions and providing course theory.

The ATO might wish to think about setting up a sizable IT workshop in one location that is equipped to support all aspect of data management. This arrangement can be highly effective in terms of staffing, materials, materials, technology, etc.

It is assumed that standard lecturing equipment will be provided. Additional teaching aids and equipment which might be appropriate to specific lectures are listed in the detailed teaching syllabus for each module. This includes suggestions for external visits where they might be available and appropriate.

This may also include provision of relevant IALA publications.

## Student numbers

The Accredited Training Organisation will determine the maximum number of participants that can reasonably acquire the necessary competence during the duration of the course. Normally this is expected to be…

# Course outline

## Course structure

The AIS Model Course is organized into two complementary learning pathways — AIS Data Management and Processing and AIS Data Utilization for Maritime Navigation and Safety. Both pathways are built around a common modular structure that ensures participants develop both technical competence and practical understanding

Module 1: AIS Data Fundamentals

Introduces the principles of the AIS system, its purpose, architecture, message types, and limitations. Provides the foundation for understanding how AIS data is generated, transmitted, and received.

Module 2: Data Management

Covers the acquisition, validation, storage, and secure handling of AIS data. Emphasis is placed on data governance, metadata, and ensuring reliability and availability for operational use.

Module 3: AIS Data Quality

Focuses on quality assurance processes, error detection, filtering techniques, and methods to improve accuracy and consistency of AIS datasets.

Module 4: Statistics and Analysis of Vessel Traffic

Provides tools and methodologies for processing AIS data to generate meaningful traffic statistics, identify patterns and trends, and support maritime situational awareness.

Module 5: Risk Assessment with AIS

Explains the use of AIS data in risk-based assessment of marine traffic, including hotspot identification, navigational safety analysis, and integration with the IALA Risk Management Toolbox.

Module 6: AIS Service Quality, Policy, and Strategy

Examines the broader applications of AIS data in policy development, service quality monitoring, maritime security, and environmental protection. Links operational analysis with strategic decision-making. Each module has been broken down into non-prioritised subject competences and competencies which show the level of knowledge that the course participants must demonstrate so they can achieve the specified level of competence. The levels of competence shown in the detailed syllabus tables explain what a successful participant should be capable of doing in the workplace on the completion of the model course. The objective of each lecture is to ensure that each participant acquires the required level of understanding in each competency so that the required learning outcome can be achieved.

The course assessor should be involved actively in course planning and its conduct. Additional time should be allocated for tutorials so that every participant who is willing to gain the required competence has every opportunity to do so. A generic outline programme, including all aspects of the model course, has been developed by the IALA World-Wide Academy and will be supplied to any accredited training organization on request.

Table 1 provides an example of a course planning programme, summarizing a course.

In order to ensure quality management, suggestions for improvement to the standard of lectures should be obtained through satisfaction feedback from participants.

Table 1 Example Course Planning Programme

| **Day** | **Module(s)** | **Lectures** | **Instruction hours** | **Other activities** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| **1** | 1 and 2 | 1 to 6 | 6 | Self test |  |
| **2** | 3 | 7 and 8 | 6 | Exercises |  |
| **3** | 4 | 9 - 12 | 6 | Exercises | Students should pass this section well to progress |
| **4** | 5 and 6 | 13 and 14 | 4 | Exercises |  |
| **5** | 7 | No lectures | 1 | Presentation | Summary of all learning |

### Detailed syllabus

(Provide the detailed syllabus with the content in a table e.g.):

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M1 AIS DATA** | **1.1 Understanding AIS Fundamentals** | Explain the basic principles of the Automatic Identification System (AIS), including its purpose, components, and how it operates in maritime contexts both in Terrestrial and Satellite.  Identify the relevant documentation for standadisation[[1]](#footnote-1). | 1 | Lecturing | 2 |
| Identify and describe the different types of AIS data (static, dynamic, and voyage-related) and their significance in maritime navigation and safety. IMO SN.1/Circ. 289 | 1 | Lecturing, simulation | 2 |
| **1.2 Technical Proficiency with AIS Data** | Demonstrate the ability to interpret AIS data, including vessel position, speed, course, and other navigational details, using both raw data and visual representations. | 2 | Simulation, exercises |  |
| Utilize AIS software tools to track and analyse vessel movements in real-time and historical contexts, assessing patterns and anomalies. | 2 |  |  |
| **1.3 Application of AIS Data in Maritime Operations** | Apply AIS data to enhance maritime safety, including including situational awareness, search and rescue operations, and traffic management in congested areas.  Analysis of complexity vessel traffic using IALA Risk Assessment Toolbox | 2 |  |  |
| Analyse the role of AIS data in maritime security and environmental protection, such as monitoring unauthorized activities and tracking vessels in sensitive marine areas. | 3 |  |  |

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M2 DATA MANAGEMENT** | **2.1 Data Management Fundamentals** | Define key terms and concepts in data management (e.g., data lifecycle, metadata, and big data) | 1 | Lecturing | 2 |
| Database Design and Management | 1 | Lecturing, simulation | 2 |
| **2.2 Appreciate the benefits of data management and the sources of support, applying the best practices for successful data management** | Discuss the benefit of data management | 2 | Simulation, exercises |  |
| Compare different source of support for data management | 2 |  |  |

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M3 AIS QUALITY** | **3.1 Common AIS Data Quality Issues** | Importance of AIS Data Quality | 1 | Lecturing | 2 |
| Identify types of errors | 1 | Lecturing, simulation | 2 |
| Interferences |  |  |  |
| **3.2 Principles and best practices of Data Quality** | Parameters considered in Data Quality | 2 | Simulation, exercises |  |
| Procedures and processes implemented for Data Quality | 2 |  |  |
| **3.3 Tools and Techniques for AIS Data Quality Management** | Improved tools for Quality Management | 2 |  |  |
| Reporting of errors and feedback mechanisms | 3 |  |  |
| Practical use of AIS Data Quality management |  |  |  |

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M4 STATISTICS AND ANALYSIS OF VESSEL TRAFFIC** | **4.1 AIS Data for statistical usage** | Identify the advantage to analyse the AIS data | 1 | Lecturing | 2 |
| Evaluate the different parameters for the analysis of AIS data | 1 | Lecturing, simulation | 2 |
| Limitations and Challenges |  |  |  |
| **4.2 Process AIS Data for statistical analysis** | Tools for AIS data extraction and storage | 2 | Simulation, exercises |  |
| Data cleaning techniques | 2 |  |  |
| **4.3 Perform statistical analysis to identify trends and patterns** | Descriptive Statistics | 2 |  |  |
| Types of Analysis | 3 |  |  |
| Present analysis results effectively for decision-making |  |  |  |
| **4.4 Apply AIS data analysis in specialized contexts** | Advanced applications |  |  |  |

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M5 RISK ASSESSMENT WITH AIS** | **5.1 Understand the fundamentals of AIS and its relevance to risk assessment** | Explain the purpose of AIS in enhancing maritime safety | 1 | Lecturing | 2 |
| Limitations and Challenges | 1 | Lecturing, simulation | 2 |
| **5.2 Acquire, preprocess, and prepare AIS data for risk assessment analysis** | Data Acquisition | 2 | Simulation, exercises |  |
| Data cleaning and integrity | 2 |  |  |
| Data Structuring and Formatting |  |  |  |
| **5.3 Analyze AIS data to evaluate risks and identify safety challenges in waterways** | Undesired scenario Risk Analysis | 2 |  |  |
| Congestion and Traffic Patterns | 3 |  |  |
| Environmental Risk Assessment |  |  |  |
| Scenario Modeling |  |  |  |
| **5.4 Apply AIS-based risk assessments in practical and strategic contexts** | Develop clear visualizations and communicate findings effectively |  |  |  |
| Infrastructure Planning |  |  |  |
| Policy Development and Stakeholder Engagement |  |  |  |
| Emergency Response Planning |  |  |  |

| **Module** | **Competence** | **Intended learning outcome** | **Level of competence** | **Teaching strategies** | **Lecture number** |
| --- | --- | --- | --- | --- | --- |
| **M6 AIS SERVICE QUALITY, POLICY AND STRATEGY** | **6.1 Manage and improve AIS service quality to meet operational and regulatory standards** | Understanding AIS service quality standards | 1 | Lecturing | 2 |
| Monitoring and evaluating AIS service Performance | 1 | Lecturing, simulation | 2 |
| Continuous improvement of AIS services |  |  |  |
| **6.2 Formulate policies for the deployment and use of AIS services in alignment with international and national regulations** | Regulatory frameworks for AIS policy | 2 | Simulation, exercises |  |
| Policy development | 2 |  |  |
| Policy implementation and compliance |  |  |  |
| **6.3 Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** | Strategic integration of AIS services | 2 |  |  |
| Risk management and contingency planning | 3 |  |  |
| Innovation and future trends |  |  |  |
| Stakeholder engagement and collaboration |  |  |  |

# DETAILED TEACHING SYLLABUS

## General Overview of the section

Each table contains information that is systematically arranged in the following manner. The line at the top of the table indicates which Module the training is related to. Modules cover a set of competencies that are described by their intended learning outcomes and performance requirements.

In this model course there are Five Modules:

Module 1: **AIS Data**

Module 2: **Data management**

Module 3: **AIS Quality**

Module 4: **Statistics and analysis of vessel traffic**

Module 5: **Risk assessment with AIS**

Module 6**: AIS Service quality, policy and strategy**

### Module

A module is a group of topics related to performing tasks and fulfilling responsibilities in accordance with relevant IALA standards. Essentially, it is a unit of content that is designed to teach a topic in a logical and coherent manner. Each module encompasses a set of competences.

### Competence

Competences are the knowledge, understanding, proficiency, skills, and experience applied to the performance of a task, or responsibility as required. Competences should be listed in the IALA competency framework.

### Intended learning outcomes

Intended learning outcomes are a set of competences (generic – subject independent and subject specific) including knowledge, understanding and skills a learner is expected to know/understand/demonstrate fter completion of a short or longer term process of learning.

### Required performance

For each intended learning outcome, a variable number of performance requirements must be met in order to demonstrate competence.

### Teaching and learning strategies

The terms "teaching and learning strategies" relate to the techniques and methods used by instructors to support student engagement and assimilation of the subject being taught. In addition to encouraging critical thinking, these strategies seek to assist students in meeting particular learning objectives and establish a productive learning environment.

## Module Syllabus

### Module 1: AIS Data

*Description of the module: This module provides a comprehensive introduction to the fundamentals, technical use, and operational applications of AIS, covering its purpose, components, data types, and relevant international standards. Participants will develop the skills to interpret and analyse AIS data using software tools, applying it to enhance maritime safety, security, traffic management, and environmental protection.*

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| **Competence 1.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **1.1** | **Understanding AIS fundamentals and quality** | |
| 1.1.1 | Explain the basic principles of the Automatic Identification System (AIS), including its purpose, components, and how it operates in maritime contexts. | |
| 1.1.2 | Identify and describe the different types of AIS data (static, dynamic, and voyage-related) and their significance in maritime navigation and safety | |

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| **Competence 1.1** | | **Understanding AIS fundamentals and quality** |
| **1.1.1** | **Explain the basic principles of the Automatic Identification System (AIS), including its purpose, components, and how it operates in maritime contexts** | |
| Required Performance: | | |
| 1. | VHF data link | |
| 2. | Protocol for data transmission | |
| 3. | Synchronisation and VDL access | |
| 4. | Process for data exchange | |
| 5. | Display of AIS data | |
| 6. | Identify the relevant documentation | |

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| **Competence 1.1** | | **Understanding AIS fundamentals and quality** |
| **1.1.2** | **Identify and describe the different types of AIS data (static, dynamic, and voyage-related) and their significance in maritime navigation and safety** | |
| Required Performance: | | |
| 1. | Messages types, identification and ASM | |
| 2. | AIS frequencies and bandwidth, channel management, transmission power | |
| 3. | Static, dynamic data and voyage data (Position, speed, course…) | |
| 4. | AIS AtoN (AIS real, virtual and Synthetic) | |
| 5. | AIS in EPIRBs and in the GMDSS, navigation equipment | |

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| **Competence 1.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **1.2** | **Technical proficiency with AIS Data** | |
| 1.2.1 | Demonstrate the ability to interpret AIS data, including vessel position, speed, course, and other navigational details, using both raw data and visual representations | |
| 1.2.2 | Utilize AIS software tools to track and analyse vessel movements in real-time and historical contexts, assessing patterns and anomalies | |

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| **Competence 1.2** | | **Technical Proficiency with AIS Data** |
| **1.2.1** | **Demonstrate the ability to interpret AIS data, including vessel position, speed, course, and other navigational details, using both raw data and visual representations** | |
| Required Performance: | | |
| 1. | Analysis of vessel traffic on a first view | |
| 2. | Number of vessels entering and leaving ports according to vessel’s size and type | |
| 3. | Flow trajectory of various vessels in a certain section within a certain period | |
| 4. | Provide data support for vessel management and channel planning | |

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| **Competence 1.2** | | **Technical Proficiency with AIS Data** |
| **1.2.2** | **Utilize AIS software tools to track and analyse vessel movements in real-time and historical contexts, assessing patterns and anomalies** | |
| Required Performance: | | |
| 1. | Analysis of complexity vessel traffic using commercial tools and IALA Risk Assessment Toolbox | |
| 2. | Describe and recognise abnormal behavior of vessels | |
| 3. | Master the feature extraction of information | |

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| **Competence 1.3** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **1.3** | **Application of AIS Data in Maritime Operations** | |
| 1.3.1 | Apply AIS data to enhance maritime safety, including situational awareness, search and rescue operations, and traffic management in congested areas | |
| 1.3.2 | Analyze the role of AIS data in maritime security and environmental protection, such as monitoring unauthorized activities and tracking vessels in sensitive marine areas | |

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| **Competence 1.3** | | **Application of AIS Data in Maritime Operations** |
| **1.3.1** | **Apply AIS data to enhance maritime safety, including situational awareness, search and rescue operations, and traffic management in congested areas** | |
| Required Performance: | | |
| 1. | Understand the concepts of CPA and TCPA | |
| 2. | Understand the concept of rate of turn | |
| 3. | Analysis of accident vessel trajectory to provide evidence for marine accident investigation | |
| 4. | Near miss accident recognition | |

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| **Competence 1.3** | | **Application of AIS Data in Maritime Operations** |
| **1.3.2** | **Analyze the role of AIS data in maritime security and environmental protection, such as monitoring unauthorized activities and tracking vessels in sensitive marine areas** | |
| Required Performance: | | |
| 1. | Awareness of specific local rules and codes for restricted areas | |
| 2. | Recognise the data can be use to enforce particular sensitive sea areas / other restrictive areas | |
| 3. | Other sensors enhancing safety, security and environment protection | |

### Module 2: Data management

*Description of Module 2: This module introduces the fundamentals of data management, including key concepts such as the data lifecycle, metadata, big data, and principles of database design and management. Participants will explore best practices, evaluate sources of support, and apply effective strategies to maximize the benefits of data management in maritime contexts.*

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| **Competence 2.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **2.1** | **Describe data management concepts and terminology** | |
| 2.1.1 | Define key terms and concepts in data management (e.g., data lifecycle, metadata, and big data). | |
| 2.1.2 | Database Design and Management | |

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| **Competence 2.1** | |  |
| **2.1.1** | **Define key terms and concepts in data management (e.g., data lifecycle, metadata, and big data)** | |
| Required Performance: | | |
| 1. | What is Data? | |
| 2. | Data Governance | |
| 3. | Data Management | |
| 4. | Data Architecture | |
| 5. | Master and Reference data | |
| 6. | Metadata | |
| 7. | Data quality | |

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| **Competence 2.1** | | **Data Management Fundamentals** |
| **2.1.2** | **Database Design and Management** | |
| Required Performance: | | |
| 1. | Explain database management systems (DBMS) and their role in data storage and retrieval | |
| 2. | Design a relational database schema using normalization techniques | |
| 3. | Data Governance and Security: key components of data governance, including policies, procedures, and frameworks, Identify common threats to data security and methods to mitigate them | |
| 4. | Data Quality and Integration: Identify the dimensions of data quality (e.g., accuracy, consistency, completeness), Use tools and techniques to clean and transform raw data into usable formats, Implement strategies for data integration across different platforms and systems, Evaluate the impact of poor data quality on decision-making and operations | |
| 5. | Data Analysis and Visualization: Explore techniques for exploratory data analysis (EDA) using software tools, Leverage descriptive and predictive analytics to support business objectives, Use data storytelling to present findings to both technical and non-technical audiences | |
| 6. | Emerging Trends in Data Management: Understand the impact of artificial intelligence (AI) and machine learning (ML) on data management, Explore the role of cloud computing and data lakes in modern data architectures, Discuss the significance of real-time data processing in decision-making | |

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| **Competence 2.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **2.2** | **Appreciate the benefits of data management and the source of support, applying the best practices for successful data management (Data managers/operators and data users)** | |
| 2.2.1 | Discuss the benefit of data management | |
| 2.2.2 | Compare different source of support for data management | |

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| **Competence 2.2** | | **Appreciate the benefits of data management and the source of support, applying the best practices for successful data management (Data managers/operators and data users)** |
| **2.2.1** | **Discuss the benefit of data management** | |
| Required Performance: | | |
| 1. | Improved Decision-Making:   * Access to Accurate Data: With effective data management, organizations can ensure they have accurate, up-to-date, and relevant data at their fingertips. This leads to better decision-making as decisions are based on high-quality data * Data-Driven Insights: Well-organized data allows for advanced analytics, enabling businesses to uncover trends, patterns, and insights that might not be visible otherwise | |
| 2. | Enhanced Productivity and Efficiency:   * Streamlined Operations: Data management systems automate data handling processes, reducing the time and effort needed to collect, store, and retrieve data. * Reduced Redundancy: Proper management eliminates duplicate data, saving storage space and ensuring consistency across the organization | |
| 3. | Regulatory Compliance | |
| 4. | Improved Data Security | |
| 5. | Cost Efficiency | |
| 6. | Better Collaboration | |

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| **Competence 2.2** | |  |
| **2.2.2** | **Compare different source of support for data management** | |
| Required Performance: | | |
| 1. | Data Management Tools:   * Database Management Systems (DBMS) * Data Integration Tools * Data Governance Tools * Data Quality Tools | |
| 2. | Cloud Storage Solutions:   * Data Lakes and Warehousing * SaaS-Based Data Management | |
| 3. | Data Management Methodologies:   * Data Lifecycle Management * Data Stewardship | |
| 4. | Professional Services and Consulting:   * Data Management Consultants * Managed Services Providers (MSPs) | |
| 5. | Educational Resources and Training:   * Online Courses and Certifications | |
|  | Open Source Communities:   * Open Source tools and limitations * Forums and Discussion Boards | |

### Module 3: AIS Quality

*Description of Module3: This module focuses on AIS data quality, addressing common issues such as errors and interferences, and highlighting their impact on maritime operations. Participants will learn principles, best practices, and practical tools for AIS data quality management, including error reporting, feedback mechanisms, and hands-on application of quality assurance processes.*

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| **Competence 3.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **3.1** | **Common AIS Data Quality Issues** | |
| 3.1.1 | Importance of AIS Data Quality | |
| 3.1.2 | Types of errors | |
| 3.1.3 | Interferences | |

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| **Competence 3.1** | | **Common AIS Data Quality Issues** |
| **3.1.1** | Importance of AIS Data Quality | |
| Required Performance: | | |
| 1. | Assess the importance on:   * Safety of navigation, * regulatory compliance, and * analytics | |

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| **Competence 3.1** | | **Common AIS Data Quality Issues** |
| **3.1.2** | Types of errors | |
| Required Performance: | | |
| 1. | * Static Data errors: incorrect MMSI, vessel name mismatches, or outdated vessel * Dynamic data errors * Voyage related errors | |

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| **Competence 3.1** | | **Common AIS Data Quality Issues** |
| **3.1.3** | Interferences | |
| Required Performance: | | |
| 1. | Signal Interference:   * Duplicate messages, * jamming / spoofing, or * data loss | |

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| **Competence 3.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **3.2** | **Principles and best practices of Data Quality** | |
| 3.2.1 | Parameters considered in Data Quality | |
| 3.2.2 | Procedures and processes implemented for Data Quality | |

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| **Competence 3.2** | | **Principles and best practices of Data Quality** |
| **3.2.1** | Parameters considered in Data Quality | |
| Required Performance: | | |
| 1. | * Accuracy: Ensuring data reflects the true value. * Completeness: All required data fields are populated. * Consistency: Data remains uniform across multiple systems. * Timeliness: Data is up-to-date and delivered promptly. * Validity: Data adheres to predefined formats and standards. | |

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| **Competence 3.2** | | **Principles and best practices of Data Quality** |
| **3.2.2** | Procedures and processes implemented for Data Quality | |
| Required Performance: | | |
| 1. | Regular Equipment Maintenance:   * Ensure position and speed reporting. * Regularly update onboard AIS software. | |
| 2. | Validation at Data Entry   * Verify static data | |
| 3. | Monitoring and Verification   * Consider monitoring systems to identify anomalies. * Compare AIS data with observations | |
| 4. | Data Governance   * Establish policies for data quality management. * Assign roles and responsibilities for data quality oversight. | |

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| **Competence 3.3** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **3.3** | **Tools and Techniques for AIS Data Quality Management** | |
| 3.3.1 | Improved tools for Quality Management | |
| 3.3.2 | Reporting of errors and feedback mechanisms | |
| 3.3.3 | Practical use of AIS Data Quality management | |

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| **Competence 3.3** | | **Tools and Techniques for AIS Data Quality Management** |
| **3.3.1** | Improved tools for Quality Management | |
| Required Performance: | | |
| 1. | AIS Data Validation Tools:   * Software solutions to detect and correct anomalies. * Integration of machine learning algorithms to identify patterns. | |
| 2. | Data Fusion: Combine AIS with other data sources (e.g., radar, satellite, ECDIS) | |

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| **Competence 3.3** | | **Tools and Techniques for AIS Data Quality Management** |
| **3.3.2** | Reporting of errors and feedback mechanisms | |
| Required Performance: | | |
| 1. | Error Reporting and Feedback Mechanisms:   * Systems for real-time error alerts. * Feedback loops for continuous improvement. | |

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| **Competence 3.3** | | **Tools and Techniques for AIS Data Quality Management** |
| **3.3.3** | Practical use of AIS Data Quality management | |
| Required Performance: | | |
| 1. | Practical scenarios | |

### Module 4: Statistics and analysis of vessel traffic

*Description of Module 4: This module introduces the use of AIS data for statistical analysis of vessel traffic, covering extraction, cleaning, and processing techniques. Learners will gain the skills to identify trends, present results effectively, and apply advanced methods in specialized maritime contexts*

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| **Competence 4.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **4.1** | **AIS Data for statistical usage** | |
| 4.1.1 | Understand the core AIS Data for statistical usage | |
| 4.1.2 | Evaluate the different parameters for the analysis of AIS data | |
| 4.1.3 | Limitations and challenges | |

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| **Competence 4.1** | | **AIS Data for statistical usage** |
| **4.1.1** | Identify the advantage to analyse the AIS data | |
| Required Performance: | | |
| 1. | Historical data analysis | |
| 2. | Historical data requirements | |
| 3. | Coverage aspects | |
| 4. | How the data is input/output | |
| 5. | Data sensors (equipment) | |

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| **Competence 4.1** | | **AIS data usage** |
| **4.1.2** | Evaluate the different parameters for the analysis of AIS data | |
| Required Performance: | | |
| 1. | Sensors / integration / fusion | |
| 2. | Real time / Real near time | |
| 3. | Validation | |

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| **Competence 4.1** | | **AIS data usage** |
| **4.1.3** | Limitations and Challenges | |
| Required Performance: | | |
| 1. | Recognize potential data integrity issues (e.g., spoofing, noise, missing data). | |
| 2. | Explain how geographical and technical factors affect AIS coverage. | |

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| **Competence 4.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **4.2** | **Process AIS Data for statistical analysis** | |
| 4.2.1 | Tools for AIS data extraction and storage | |
| 4.2.2 | Data cleaning techniques | |

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| **Competence 4.2** | | **Process AIS Data for statistical analysis** |
| **4.2.1** | Tools for AIS data extraction and storage | |
| Required Performance: | | |
| 1. | Introduction to AIS data formats and conversion | |
| 2. | Access AIS data from available sources (real-time feeds, historical databases) | |
| 3. | Extract raw data in NMEA or other standardized formats from various sources | |
| 4. | Organize data into structured formats for analysis (e.g., time-series) | |

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| **Competence 4.2** | | **Process AIS Data for statistical analysis** |
| **4.2.2** | Data cleaning techniques | |
| Required Performance: | | |
| 1. | Clean and preprocess AIS data for analysis   * Identify and correct errors in AIS data * handling duplicates, * errors, and * handle missing or incomplete datasets appropriately | |

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| **Competence 4.3** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **4.3** | **Perform statistical analysis to identify trends and patterns** | |
| 4.3.1 | Descriptive Statistics | |
| 4.3.2 | Types of Analysis | |
| 4.3.3 | Present analysis results effectively for decision-making | |

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| **Competence 4.3** | | **Perform statistical analysis to identify trends and patterns** |
| **4.3.1** | Descriptive statistics | |
| Required Performance: | | |
| 1. | Compute traffic density, average speed, and vessel counts | |
| 2. | Generate summary statistics for different vessel types | |

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| **Competence 4.3** | | **Perform statistical analysis to identify trends and patterns** |
| **4.3.2** | Types of analysis | |
| Required Performance: | | |
| 1. | Spatial Analysis   * Create traffic density heatmaps * Analyze route patterns and chokepoints in maritime areas | |
| 2. | Temporal Analysis   * Identify traffic patterns over time (e.g., daily, monthly, seasonal trends) * Analyze temporal variations in port traffic | |
| 3. | Risk Assessment   * Identify collision risk areas using AIS traffic data * Evaluate safety metrics based on vessel behaviors | |

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| **Competence 4.3** | | **Perform statistical analysis to identify trends and patterns** |
| **4.3.3** | Present analysis results effectively for decision-making | |
| Required Performance: | | |
| 1. | Data Visualization   * Create charts, graphs, and maps to represent findings * Use GIS tools (e.g., QGIS) for spatial visualizations | |
| 2. | Reporting and Presentation   * Compile findings into clear, actionable reports * Present results effectively to stakeholders using multimedia tools | |

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| **Competence 4.4** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **4.4** | **Apply AIS data analysis in specialized contexts** | |
| 4.4.1 | Advanced applications | |

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| **Competence 4.4** | | **Apply AIS data analysis in specialized contexts** |
| **4.4.1** | Advanced applications | |
| Required Performance: | | |
| 1. | Environmental Monitoring   * Assess environmental impacts using AIS data (e.g., emissions tracking) * Identify vessel activity in marine protected areas | |
| 2. | Port Operations Optimization   * Analyze port congestion and berthing delays. * Support port efficiency through traffic scheduling insights | |
| 3. | Strategic Planning;   * Propose new routes or infrastructure based on traffic analysis. * Support long-term planning with predictive analytics | |

### Module 5: Risk assessment with AIS

*Description of Module 5: This module explores how AIS data supports risk assessment, from acquisition and preprocessing to structured analysis of safety challenges. Participants will learn to apply AIS-based risk assessments for decision-making in infrastructure planning, policy, and emergency response*

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| **Competence 5.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **5.1** | **Understand the fundamentals of AIS and its relevance to risk assessment** | |
| 5.1.1 | Explain the purpose of AIS in enhancing maritime safety | |
| 5.1.2 | Limitations and challenges | |

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| **Competence 5.1** | | **Understand the fundamentals of AIS and its relevance to risk assessment** |
| **5.1.1** | Explain the purpose of AIS in enhancing maritime safety | |
| Required Performance: | | |
| 1. | Key AIS message components relevant to risk assessment:   * position, * speed, * heading | |
| 2. | Evaluate the different parameters for the analysis of AIS data | |
| 3. | AIS data supports compliance with waterway risk management frameworks   * IMO * IALA * PIANC | |

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| **Competence 5.1** | | **Understand the fundamentals of AIS and its relevance to risk assessment** |
| **5.1.2** | Limitations and challenges | |
| Required Performance: | | |
| 1. | Identify and list the additional data that can support the evaluation of the waterway | |
| 2. | Limitations and challenges of AIS data for risk evaluation | |

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| **Competence 5.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **5.2** | **Acquire, preprocess, and prepare AIS data for risk assessment analysis** | |
| 5.2.1 | Data Acquisition | |
| 5.2.2 | Data Cleaning and Integrity | |
| 5.2.3 | Data Structuring and Formatting | |

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| **Competence 5.2** | | **Acquire, preprocess, and prepare AIS data for risk assessment analysis** |
| **5.2.1** | Data Acquisition | |
| Required Performance: | | |
| 1. | Access AIS data from sources such as shore-based stations, satellites, and public databases | |
| 2. | Retrieve data in real-time or as historical records | |

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| **Competence 5.2** | | **Acquire, preprocess, and prepare AIS data for risk assessment analysis** |
| **5.2.2** | Data Cleaning and Integrity | |
| Required Performance: | | |
| 1. | Identify and correct errors such as duplicate entries, incomplete records, or outliers | |
| 2. | Handle missing data appropriately to ensure robust analysis | |

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| **Competence 5.2** | | **Acquire, preprocess, and prepare AIS data for risk assessment analysis** |
| **5.2.3** | Data Structuring and Formatting | |
| Required Performance: | | |
| 1. | Convert raw AIS data (e.g., NMEA) into structured formats suitable for analysis (e.g., CSV, JSON) | |
| 2. | Organize data based on geographic areas, vessel types, or timeframes | |

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| **Competence 5.3** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **5.3** | **Analyze AIS data to evaluate risks and identify safety challenges in waterways** | |
| 5.3.1 | Undesired scenario Risk Analysis | |
| 5.3.2 | Congestion and Traffic Patterns | |
| 5.3.3 | Environmental Risk Assessment | |
| 5.3.4 | Scenario Modeling | |

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| **Competence 5.3** | | **Analyze AIS data to evaluate risks and identify safety challenges in waterways** |
| **5.3.1** | Undesired scenario Risk Analysis | |
| Required Performance: | | |
| 1. | Identify and describe the different scenarios that can be assessed with the availability of AIS data | |
| 2. | Describe the root cause of the undesired scenario | |
| 3. | Use AIS data to calculate Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA) | |

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| **Competence 5.3** | | **Analyze AIS data to evaluate risks and identify safety challenges in waterways** |
| **5.3.2** | Congestion and Traffic Patterns | |
| Required Performance: | | |
| 1. | Identify high-risk zones for vessel interactions | |
| 2. | Congestion and Traffic Patterns:   * Analyze traffic density and vessel movement patterns to assess congestion levels * Identify bottlenecks and propose measures for improving traffic flow | |
| 3. | Analysis and determination of near-miss accidents | |

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| **Competence 5.3** | | **Analyze AIS data to evaluate risks and identify safety challenges in waterways** |
| **5.3.3** | Environmental Risk Assessment | |
| Required Performance: | | |
| 1. | Use AIS data to assess vessel impacts on environmentally sensitive areas | |
| 2. | Identify high-risk areas for spills or pollution based on traffic data | |

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| **Competence 5.3** | | **Analyze AIS data to evaluate risks and identify safety challenges in waterways** |
| **5.3.4** | Scenario Modeling | |
| Required Performance: | | |
| 1. | Simulate various risk scenarios using historical AIS data in IWRAP MK II   * Undesired scenarios * Near-misses * Hypothetical collisions | |
| 2. | Predict the impact of changes in traffic patterns or infrastructure | |

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| **Competence 5.4** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **5.4** | **Apply AIS-based risk assessments in practical and strategic contexts** | |
| 5.4.1 | Develop clear visualizations and communicate findings effectively | |
| 5.4.2 | Infrastructure Planning | |
| 5.4.3 | Policy Development and Stakeholder Engagement | |
| 5.4.4 | Emergency Response Planning | |

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| **Competence 5.4** | | **Apply AIS-based risk assessments in practical and strategic contexts** |
| **5.4.1** | Develop clear visualizations and communicate findings effectively | |
| Required Performance: | | |
| 1. | Risk Visualization:   * Create heatmaps, risk zones, and spatial overlays using GIS tools. * Generate visual indicators of congestion, collision risks, or environmental hazards. | |
| 2. | Reporting and Presentation:   * Develop concise reports summarizing risk assessment findings. * Present results effectively to stakeholders, using visuals and narrative to support recommendations | |

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| **Competence 5.4** | | **Apply AIS-based risk assessments in practical and strategic contexts** |
| **5.4.2** | Infrastructure Planning | |
| Required Performance: | | |
| 1. | Use AIS data to support decisions on AtoN deploymen, waterway infrastructure, maritime services etc. | |
| 2. | Propose traffic management strategies based on risk patterns | |

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| **Competence 5.4** | | **Apply AIS-based risk assessments in practical and strategic contexts** |
| **5.4.3** | Policy Development and Stakeholder Engagement | |
| Required Performance: | | |
| 1. | Support the development of policies and procedures to reduce navigational risks | |
| 2. | Collaborate with maritime authorities and stakeholders to implement safety measures | |

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| **Competence 5.4** | | **Apply AIS-based risk assessments in practical and strategic contexts** |
| **5.4.4** | Emergency Response Planning | |
| Required Performance: | | |
| 1. | Use AIS data to model and improve response strategies for incidents. | |
| 2. | Identify high-risk areas requiring additional emergency resources. | |

### Module 6: AIS Service quality, policy and strategy

*Description of Module 6: This module addresses AIS service quality, policy, and strategy, focusing on performance monitoring, regulatory compliance, and continuous improvement. Learners will develop skills to design policies and strategies that integrate AIS into maritime safety, traffic management, and future innovation.*

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| **Competence 6.1** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **6.1** | **Manage and improve AIS service quality to meet operational and regulatory standards** | |
| 6.1.1 | Understand the core AIS Data for statistical usage | |
| 6.1.2 | Evaluate the different parameters for the analysis of AIS data | |
| 6.1.3 | Limitations and challenges | |

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| **Competence 6.1** | | **Manage and improve AIS service quality to meet operational and regulatory standards** |
| **6.1.1** | Understand the core AIS Data for statistical usage | |
| Required Performance: | | |
| 1. | Identify international standards for AIS services (e.g., IMO, ITU, IALA guidelines) | |
| 2. | Define key performance indicators (KPIs) for AIS service quality, such as data accuracy, coverage, latency, and reliability | |

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| **Competence 6.1** | | **Manage and improve AIS service quality to meet operational and regulatory standards** |
| **6.1.2** | Monitoring and Evaluating AIS Service Performance | |
| Required Performance: | | |
| 1. | Analyze AIS performance metrics and identify gaps or failures in service. | |
| 2. | Use diagnostic tools to evaluate signal coverage, data integrity, and system availability | |

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| **Competence 6.1** | | **Manage and improve AIS service quality to meet operational and regulatory standards** |
| **6.1.3** | Continuous Improvement of AIS Services | |
| Required Performance: | | |
| 1. | Implement feedback mechanisms for service improvement based on user input. | |
| 2. | Develop action plans to enhance service quality and ensure compliance with regulatory standards | |

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| **Competence 6.2** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **6.2** | **Formulate policies for the deployment and use of AIS services in alignment with international and national regulations** | |
| 6.2.1 | Regulatory Frameworks for AIS Policy | |
| 6.2.2 | Policy Development | |
| 6.2.3 | Policy Implementation and Compliance | |

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| **Competence 6.2** | | **Formulate policies for the deployment and use of AIS services in alignment with international and national regulations** |
| **6.2.1** | Regulatory Frameworks for AIS Policy | |
| Required Performance: | | |
| 1. | Explain international conventions and regulations governing AIS (e.g., SOLAS, IMO guidelines) | |
| 2. | Identify national legal frameworks for AIS deployment and use | |

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| **Competence 6.2** | | **Formulate policies for the deployment and use of AIS services in alignment with international and national regulations** |
| **6.2.2** | Policy Development | |
| Required Performance: | | |
| 1. | Draft policies that define AIS implementation procedures, data-sharing protocols, and compliance requirements | |
| 2. | Address privacy, data security, and ethical considerations in AIS policy | |

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| **Competence 6.2** | | **Formulate policies for the deployment and use of AIS services in alignment with international and national regulations** |
| **6.2.3** | Policy Implementation and Compliance | |
| Required Performance: | | |
| 1. | Develop strategies to ensure stakeholder compliance with AIS policies | |
| 2. | Monitor and enforce policy adherence across different maritime sectors | |

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| **Competence 6.3** | |  |
| **INTENDED LEARNING OUTCOMES:**  Demonstrates a knowledge and understanding of: | | |
| **6.3** | **Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** | |
| 6.3.1 | Strategic integration of AIS services | |
| 6.3.2 | Risk management and contingency planning | |
| 6.3.3 | Innovation and future trends | |
| 6.3.4 | Stakeholder engagement and collaboration | |

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| **Competence 6.3** | | **Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** |
| **6.3.1** | Strategic integration of AIS services | |
| Required Performance: | | |
| 1. | Develop frameworks for integrating AIS with other navigational tools (e.g., radar, VTS, ECDIS) | |
| 2. | Design strategies for optimizing AIS use in port operations and vessel traffic monitoring | |

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| **Competence 6.3** | | **Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** |
| **6.3.2** | Risk management and contingency planning | |
| Required Performance: | | |
| 1. | Identify risks associated with AIS system failures or misuse | |
| 2. | Develop contingency plans to ensure operational continuity during system outages | |

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| **Competence 6.3** | | **Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** |
| **6.3.3** | Innovation and future trends | |
| Required Performance: | | |
| 1. | Analyze emerging technologies and trends (e.g., VDES, use of ASM, satellite AIS, machine learning) to enhance AIS services | |
| 2. | Propose strategic initiatives to future-proof AIS systems | |

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| **Competence 6.3** | | **Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks** |
| **6.3.4** | Stakeholder engagement and collaboration | |
| Required Performance: | | |
| 1. | Identify key stakeholders involved in AIS services (e.g., maritime authorities, shipping companies, technology providers) | |
| 2. | Develop strategies for engaging stakeholders in policy and strategic planning | |
| 3. | Collaborate with international organizations to align AIS services with global standards | |
| 4. | Participate in joint initiatives to enhance cross-border AIS data sharing and interoperability | |

# EVALUATION AND ASSESSMENT

Assessors should develop the assessment tasks based on the constructive alignment principles.

A diagram of learning outcomes

Description automatically generated

Assessor should refer to identified levels of competence as described in the Bloom’s taxonomy framework.

It important to highlight that bloom’s taxonomy includes three main learning domains:

* Cognitive domain: focused on intellectual skills, knowledge and capacity of analysis/problem solving
* Affective domain: focused on attitudes, values, interests, and appreciation of learners
* Psychomotor domain: focused on the ability of learners to physically accomplish tasks and perform movement and skill

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| **Level** | **Level naming** | **Knowledge and/or Attitude and skills** | **Taxonomy versb for learning outcomes' formulation** |
| Level 1 | Comprehension | **Guided response** | describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss. |
| Here, individuals know more about what the information actually means. They can start organizing, comparing and interpreting it themselves |
| Level 2 | Application | **Autonomous response** | calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, perform, present. |
| At this level, knowledge is used in new ways, and applied to solve more complex problems |
| Level 3 | Analysis | **Complexe observable response** | classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate. |
| At this level, knowledge is used in new ways, and applied to solve more complex problems. |
| Level 4 | Synthesis | **Adaptation** | choose, support, relate, determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate. |
| This involves breaking information into parts, to examine them individually and to see how they relate to each other. |
| Level 5 | Evaluation | **Creation of new practices and/or procedures** | design, formulate, build, invent, create, compose, generate, derive, modify, develop. |
| Here, individuals make judgments about what they've discovered so far, allowing them to make confident recommendations and suggest innovative ideas. |

# DEFINITIONS

The definitions of terms used in this Guideline can be found in the *International Dictionary of Marine Aids to Navigation* (IALA dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

# abbreviations

This section should be typed with the **Abbreviations** style. The acronym or initialism is typed and then tab is pressed so that the style inserts the appropriate tabs and paragraph spacings e.g.:

NGO Non-governmental organization

VTS Vessel Traffic Services

The list should be typed in alphabetical order. The text automatically aligns as an indented paragraph until carriage return is hit and then the next term can be entered.

# references

References are sources directly referred to in the running text and should be given a sequential number, starting at 1. The reference number should be included as close to the referenced text as possible and included as a number within square brackets.

The reference should be listed in the References section in the following syntax using the **Reference** **list** style:

[Author surname,] <space> [initial.] <space> [year] <space> [title.]

For example:

“Hawking also suggests ways that quantum mechanics can be combined with the theory of special relativity [1]. This text builds on his discussion of the instability of black holes described in *A Brief History of Time* [2].”

should be included in the reference list as follows:

1. Hawking, S. (2001) The Universe in a Nutshell.
2. Hawking, S. (1988) A Brief History of Time.

The **Reference list** style will add a number for the reference as soon as you start typing the text and the paragraph will automatically align with the first line of text. Press return to enter a new reference in the list.

# Further reading

Any texts that are recommended to the reader without direct reference in the text should be listed within this section using the same syntax as the reference list. Sources should be listed using the **Further reading** style.

1. Einstein, A. (1905) Relativity: The Special and General Theory of Relativity
2. Idle, E. (1984) The Galaxy Song
3. Example of appendix Title (Head 1) style

Appendices should be started on a separate page and contain information that is directly relevant to the main body of the text at a certain point, but that would be too large or distracting to include at that particular point. There are four levels of appendix heading styles available in the **Style Gallery.**

* 1. Example of Appendix Head 1 style
     1. Example of Appendix Head 2 Style

At the end of the **Appendix head 2** style text press carriage return, the following paragraph is **the Heading 1 separation line** style, press carriage return again, and the following line will be in **Body text** style.

* + - 1. Example of Appendix head 3 style

The same following formatting applies to the **Appendix Head 3** style i.e., press carriage return, the following paragraph is the **Heading 2 separation line** style, press carriage return again, and you will be back to body text.

* + - * 1. Example of Appendix Head 4 style

The Appendix Head 4 style is followed by body text and does not have a separation line. Only the level 1 **Appendix Title** will appear in the TOC.

* + - * 1. Example of Appendix Head 5 style

The **Appendix Head 5 style** is followed by body text and does not have a separation line. Figure and tables should be labelled as a continuation from the main Guideline content.

1. Example of Annex title (Head 1) style

Annexes should include information that can exist in isolation e.g.

* a technical specification for a new piece of equipment;
* the content and structure of a new training module; or
* the detail associated with a new recommendation for an AIS.

Annexes can include appendices if required. There are also four levels of annex heading styles available in the **Style Gallery.** In addition to the **Annex title** (**Head 1)** style there is **Annexe Head 2**, **Annexe Head 3** and **Annexe Head 4**. These follow a similar format to the appendix heading styles. As many annexes can be included as needed and it is advisable to separate them with a page break. Only the level 1 **Annex title** style text will appear in the TOC.

* 1. Example of Annex Head 2 style
     1. Example of Annex Head 3 style
        1. Example of Annex Head 4 style

Annex figures and tables should be labelled with the **Annex Figure Caption** and **Annex Table Caption** styles respectively, rather than the main figure and table caption styles. This ensures the annex can be read logically in isolation and that annex figures and tables are not included in the List of Figures and Tables respectively on the main Guideline contents page.

1. Example of annex figure caption
   * + - 1. Example of Annex Head 5 style

1. Relevant documents are G1082 An Overview of AIS, SOLAS Chapt. 5, below a specific list:

   **ITU**

   * ITU-R M.1371-5 Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band (AIS)
   * ITU-R M.585-8 Assignment and use of identities in the maritime mobile service (MMSI)
   * ITU-R M.1842-1 Characteristics of VHF radio systems and equipment for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels
   * ITU Radio Regulations Appendix 18
   * ITU Table of Maritime Identification Digits (MID)

   **IALA:**

   * R0143 Provision of Virtual Aids to Navigation
   * R0126 The Use of the Automatic Identification System (AIS) in Marine Aid to Navigation Services
   * G1081 Virtual Aids to Navigation
   * G1062 The establishment of AIS as an Aid to Navigation
   * G1084 Authorisation of AIS AtoN
   * G1050 The Management and Monitoring of AIS Information
   * R0123 The Provision of Shore Based Automatic Identification System (AIS)
   * R0144 Harmonised Implementation of Application-Specific Messages (ASM)
   * R0124 The AIS Service
   * R0124 App 0 References, Glossary of terms and Abbreviations
   * R0124 App 1 Basic AIS Services, AIS Data Model and AIS Service specific MDEF sentences
   * R0124 App 3 Distribution model of the AIS Service
   * R0124 App 4 Interaction and Data Flow Model of the AIS service
   * R0124 App 5 Interfacing model of the AIS Service
   * R0124 App 9, 10, 11 Functional Description of the AIS Service components (AIS-PCU, AIS-LSS & AIS-SM))
   * R0124 App 12 Co-location issues at AIS Physical Shore Stations (AIS-PSS) and on-site infrastructure considerations
   * R0124 App 14 FATDMA Planning and Operation of an AIS Service
   * R0124 App 16 DGNSS Broadcasts from an AIS Service
   * R0124 App 17 Channel Management by an AIS Service
   * R0124 App 18 VDL Load Management
   * R0124 App 19 Satellite AIS Considerations
   * G1095 Harmonised Implementation of Application-Specific Messages (ASM)
   * G1098 The Application of AIS - AtoN on Buoys

   **Others**

   * Automatic Identification System (AIS) Mobile Aids to Navigation (MAtoN) Stations standard RTCM 12110.0

   [↑](#footnote-ref-1)