

		Required performances	
<div>Modules</div>		<div>Competences</div>	
<div>Module 1: AIS Data</div>	<div>Competences:</div> <div>1.1 Understanding AIS fundamentals and quality</div> <div>1.2 Technical proficiency with AIS data</div> <div>1.3 Application of AIS data in maritime operations</div>	<div>3.1.1 Explain the basic principles of the Automatic Identification System (AIS), including its purpose, components, and how it operates in maritime contexts</div> <div>VHF data link Protocol for data transmission Synchronization and VDL access Process for data exchange Display of AIS data Identify the relevant documentation</div>	<div>3.1.2 Identify and describe the different types of AIS data (static, dynamic, and voyage-related) and their significance in maritime navigation and safety</div> <div>Messages, identification and ASM AIS frequencies and bandwidth, channel management, transmission power Static, dynamic data and voyage data (Position, speed, course,...) AIS Aton (AIS real, virtual and Synthetic) AIS in EPIRBs and in the GMDSS, navigation equipment</div>
	<div>Competence 1.1 Understanding AIS fundamentals and quality</div> <div>1.1.1 Explain the basic principles of the Automatic Identification System (AIS), including its purpose, components, and how it operates in maritime contexts</div> <div>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</div>	<div>3.1.3 Demonstrate the ability to interpret AIS data, including vessel position, speed, course, and other navigational details, using both raw data and visual representations</div> <div>Analysis of vessel traffic on a first view Number of vessels entering and leaving ports according to vessel's size and type Flow trajectory of various vessels in a certain section within a certain period Provide data support for vessel management and channel planning</div>	<div>3.1.2 Utilize AIS software tools to track and analyse vessel movements in real-time and historical contexts, assessing patterns and anomalies</div> <div>Analysis of complexity vessel traffic using IALA Risk Assessment Toolbox Describe and recognise abnormal behavior of vessels Master the feature extraction</div>
	<div>Competence 1.2 Technical Proficiency with AIS Data</div> <div>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</div> <div>1.2.2 Utilize AIS software tools to track and analyse vessel movements in real-time and historical contexts, assessing patterns and anomalies</div>	<div>3.1.1 Define key terms and concepts in data management (e.g., data lifecycle, metadata, and big data)</div> <div>What is Data? Data Governance Data Management Data Architecture Master and Reference data Metadata Data quality</div>	<div>3.1.2 Analyze the role of AIS data in maritime security and environmental protection, such as monitoring unauthorized activities and tracking vessels in sensitive marine areas</div> <div>Recall specific rules and codes for restricted areas Recognise the data can be used to enforce particular sensitive sea areas / other restrictive areas Other sensors enhancing safety, security and environment protection</div>
	<div>Competence 1.3 Application of AIS Data in Maritime Operations</div> <div>1.3.1 Apply AIS data to enhance maritime safety, including collision avoidance, search and rescue operations, and traffic management in congested areas</div> <div>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</div>	<div>2.1.2 Database Design and Management</div> <div>Explain database management systems (DBMS) and their role in data storage and retrieval Design a relational database schema using normalization techniques 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 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 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 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</div>	<div>2.2.2 Compare different source of support for data management</div> <div>Data Management Tools:</div> <ul style="list-style-type: none">Database Management Systems (DBMS): Tools like MySQL, PostgreSQL, Oracle, and SQL Server provide structured storage, retrieval, and management of data. They support complex queries, data integrity, and security.Data Integration Tools: Tools such as Apache Nifi, Talend, and Informatica help in integrating data from various sources into a unified view. They support Extract, Transform, Load (ETL) processes to ensure data consistency and quality.Data Governance Tools: Collibra and Alation are examples that help in defining, implementing, and enforcing data governance policies. They ensure data is managed according to regulatory requirements and organizational standards.Data Quality Tools: Tools like Trifacta, Talend Data Quality, and IBM InfoSphere QualityStage focus on cleaning, standardizing, and enriching data to improve its quality.Cloud-Based Services:<ul style="list-style-type: none">Cloud Storage Solutions: Providers like Amazon Web Services (AWS), Google Cloud, and Microsoft Azure offer scalable storage solutions that allow organizations to store and manage vast amounts of data. They also provide tools for data backup, recovery, and lifecycle management.Data Lakes and Warehousing: Cloud services like AWS Redshift, Google BigQuery, and Azure Synapse Analytics offer managed data warehouses and data lakes, which are designed to store large datasets in structured and unstructured formats.SaaS-Based Data Management: Services such as Snowflake and Databricks provide cloud-native platforms for managing data with integrated analytics and machine learning capabilities. <div>Data Management Methodologies:</div> <ul style="list-style-type: none">Master Data Management (MDM): MDM involves creating a single, consistent, and accurate source of truth for critical business data. It typically involves tools and practices to standardize data across an organization.Data Lifecycle Management: This involves policies and procedures for managing data from its creation and initial storage to the time it becomes obsolete and is deleted. It ensures data is available when needed and disposed of when no longer necessary.Data Stewardship: Data stewardship programs assign responsibility for specific data domains to individuals or teams. These stewards ensure data is accurate, consistent, and used properly across the organization. <div>Professional Services and Consulting</div> <ul style="list-style-type: none">Data Management Consultants: Companies like Deloitte, Accenture, and PwC offer consulting services to help organizations develop data management strategies, implement tools, and ensure compliance with regulations.Managed Services Providers (MSPs): MSPs offer outsourced data management services, including data backup, disaster recovery, and ongoing maintenance of data systems. <div>Educational Resources and Training</div> <ul style="list-style-type: none">Online Courses and Certifications: Platforms like Coursera, edX, and Udacity offer courses on data management, data governance, and data analytics. Certifications like Certified Data Management Professional (CDMP) are also available for professionals seeking formal recognition.Industry Conferences and Webinars: Events like the Data Management Summit or webinars from organizations like DAMA International provide insights into best practices, emerging trends, and new technologies in data management. <div>Open Source Communities</div> <ul style="list-style-type: none">Open Source Projects: Communities around projects like Apache Hadoop, Apache Cassandra, and PostgreSQL offer resources, forums, and collaboration opportunities for managing data using open-source tools.Forums and Discussion Boards: Websites like Stack Overflow, GitHub, and Reddit provide platforms where professionals can share knowledge, troubleshoot issues, and collaborate on data management challenges.
<div>Module 2: Data management</div>	<div>Competences:</div> <div>2.1 Describe data management concepts and terminology</div> <div>2.2 Appreciate the benefits of data management and the sources of support, applying the best practices for successful data management</div>	<div>2.2.1 Discuss the benefit of data management</div> <div>Improved Decision-Making:<ul style="list-style-type: none">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 dataData-Driven Insights: Well-organized data allows for advanced analytics, enabling businesses to uncover trends, patterns, and insights that might not be visible otherwise</div> <div>Enhanced Productivity and Efficiency:<ul style="list-style-type: none">Streamlined Operations: Data management systems automate data handling processes, reducing the time and effort needed to collect, store, and retrieve data.Reduce Redundancy: Proper management eliminates duplicate data, saving storage space and ensuring consistency across the organizationRegulatory ComplianceImproved Data SecurityCost EfficiencyBetter Collaboration</div>	<div>3.1.2 Types of errors</div> <div>Static Data errors: incorrect MMU, vessel name mismatches, or outdated vessel type Dynamic Data errors Voyage related errors</div>
<div>Module 3: AIS Quality</div>	<div>Competences:</div> <div>3.1 Common AIS Data Quality Issues</div> <div>3.2 Principles and best practices of Data Quality</div> <div>3.3 Tools and Techniques for AIS Data Quality Management</div>	<div>3.1.1 Importance of AIS Data Quality</div> <div>Assess the impact importance on:<ul style="list-style-type: none">Navigation safety, safety of navigationregulatory compliance, andanalytics</div>	<div>3.1.2 Types of errors</div> <div>Static Data errors: incorrect MMU, vessel name mismatches, or outdated vessel type Dynamic Data errors Voyage related errors</div>
	<div>Competence 3.1 Common AIS Data Quality Issues</div> <div>3.1.1 Importance of AIS Data Quality</div> <div>3.1.2 Types of errors</div> <div>3.1.3 Interferences</div>	<div>3.1.1 Importance of AIS Data Quality</div> <div>Assess the impact importance on:<ul style="list-style-type: none">Navigation safety, safety of navigationregulatory compliance, andanalytics</div>	<div>3.1.2 Types of errors</div> <div>Static Data errors: incorrect MMU, vessel name mismatches, or outdated vessel type Dynamic Data errors Voyage related errors</div>
	<div>Competence 3.2 Principles and best practices of Data Quality</div> <div>3.2.1 Parameters considered in Data Quality</div> <div>3.2.2 Procedures and processes implemented for Data Quality</div>	<div>3.1.1 Importance of AIS Data Quality</div> <div>Assess the impact importance on:<ul style="list-style-type: none">Navigation safety, safety of navigationregulatory compliance, andanalytics</div>	<div>3.1.2 Types of errors</div> <div>Static Data errors: incorrect MMU, vessel name mismatches, or outdated vessel type Dynamic Data errors Voyage related errors</div>
	<div>Competence 3.3 Tools and Techniques for AIS Data Quality Management</div> <div>3.3.1 Improved tools for Quality Management</div> <div>3.3.2 Reporting of errors and feedback mechanisms</div> <div>3.3.3 Practical use of AIS Data Quality management</div>	<div>3.1.1 Importance of AIS Data Quality</div> <div>Assess the impact importance on:<ul style="list-style-type: none">Navigation safety, safety of navigationregulatory compliance, andanalytics</div>	<div>3.1.2 Types of errors</div> <div>Static Data errors: incorrect MMU, vessel name mismatches, or outdated vessel type Dynamic Data errors Voyage related errors</div>
<div>Module 4: Statistics and analysis of vessel traffic</div>	<div>Competences:</div> <div>4.1 AIS Data for statistical usage</div> <div>4.2 Process AIS Data for statistical analysis</div> <div>4.3 Perform statistical analysis to identify trends and patterns</div> <div>4.4 Apply AIS data analysis in specialized contexts</div>	<div>4.1.1 Identify the advantage to analyse the AIS data</div> <div>4.1.2 Evaluate the different parameters for the analysis of AIS data</div> <div>4.1.3 Limitations and Challenges</div>	<div>4.1.2 Evaluate the different parameters for the analysis of AIS data</div> <div>Sensors / Integration / Fusion Real time / Real near time Validation</div>
	<div>Competence 4.1 Understand the core AIS Data for statistical usage</div> <div>4.1.1 Identify the advantage to analyse the AIS data</div> <div>4.1.2 Evaluate the different parameters for the analysis of AIS data</div> <div>4.1.3 Limitations and Challenges</div>	<div>4.1.1 Identify the advantage to analyse the AIS data</div> <div>Historical data analysis Historical data requirements Coverage aspects How the data is input/output Data sensors (equipment)</div>	<div>4.1.2 Evaluate the different parameters for the analysis of AIS data</div> <div>Sensors / Integration / Fusion Real time / Real near time Validation</div>
	<div>Competence 4.2 Process AIS Data for statistical analysis</div> <div>4.2.1 Tools for AIS data extraction and storage</div> <div>4.2.2 Data cleaning techniques</div>	<div>4.2.1 Tools for AIS data extraction and storage</div> <div>Introduction to AIS data formats and conversion Access AIS data from available sources (real-time feeds, historical databases) Extract raw data in NMEA or other standardized formats from various sources Organize data into structured formats for analysis (e.g., time-series)</div>	<div>4.2.2 Data cleaning techniques</div> <div>Clean and preprocess AIS data for analysis Identify and correct errors in AIS data</div> <ul style="list-style-type: none">handling duplicates,errors, andhandle missing or incomplete datasets appropriately
	<div>Competence 4.3 Perform statistical analysis to identify trends and patterns</div> <div>4.3.1 Descriptive Statistics</div> <div>4.3.2 Types of Analysis</div> <div>4.3.3 Present analysis results effectively for decision-making</div>	<div>4.3.1 Descriptive Statistics</div> <div>Compute traffic density, average speed, and vessel counts Generate summary statistics for different vessel types</div>	<div>4.3.2 Types of Analysis</div> <div>Spatial Analysis<ul style="list-style-type: none">Create traffic density heatmapsAnalyze route patterns and chokepoints in maritime areas<div>Temporal Analysis</div><ul style="list-style-type: none">Identify traffic patterns over time (e.g., daily, monthly, seasonal trends)Analyze temporal variations in port traffic<div>Risk Assessment</div><ul style="list-style-type: none">Identify collision risk areas using AIS traffic dataEvaluate safety metrics based on vessel behaviors</div>
<div>Module 5: Risk assessment with AIS</div>	<div>Competences:</div> <div>5.1 Understand the fundamentals of AIS and its relevance to risk assessment</div> <div>5.2 Acquire, preprocess, and prepare AIS data for risk assessment analysis</div> <div>5.3 Analyze AIS data to evaluate risks and identify safety challenges in waterways</div> <div>5.4 Apply AIS-based risk assessments in practical and strategic contexts</div>	<div>5.1.1 Explain the purpose of AIS in enhancing maritime safety</div> <div>Key AIS message components relevant to risk assessment:<ul style="list-style-type: none">position,speed,heading</div> <div>Evaluate the different parameters for the analysis of AIS data</div> <div>AIS data supports compliance with waterway risk management frameworks</div> <ul style="list-style-type: none">IMOIALAPIANC	<div>5.1.2 Limitations and Challenges</div> <div>Identify and list the additional data that can support the evaluation of the waterway</div> <div>Limitations and challenges of AIS data for risk evaluation</div>
	<div>Competence 5.1 Understand the fundamentals of AIS and its relevance to risk assessment</div> <div>5.1.1 Explain the purpose of AIS in enhancing maritime safety</div> <div>5.1.2 Limitations and Challenges</div>	<div>5.1.1 Explain the purpose of AIS in enhancing maritime safety</div> <div>Key AIS message components relevant to risk assessment:<ul style="list-style-type: none">position,speed,heading</div> <div>Evaluate the different parameters for the analysis of AIS data</div> <div>AIS data supports compliance with waterway risk management frameworks</div> <ul style="list-style-type: none">IMOIALAPIANC	<div>5.1.2 Limitations and Challenges</div> <div>Identify and list the additional data that can support the evaluation of the waterway</div> <div>Limitations and challenges of AIS data for risk evaluation</div>
	<div>Competence 5.2 Acquire, preprocess, and prepare AIS data for risk assessment analysis</div> <div>5.2.1 Data Acquisition</div> <div>5.2.2 Data Cleaning and Integrity</div> <div>5.2.3 Data Structuring and Formatting</div>	<div>5.2.1 Data Acquisition</div> <div>Access AIS data from sources such as shore-based stations, satellites, and public databases Retrieve data in real-time or as historical records</div>	<div>5.2.2 Data Cleaning and Integrity</div> <div>Identify and correct errors such as duplicate entries, incomplete records, or outliers Handle missing data appropriately to ensure robust analysis</div>
	<div>Competence 5.3 Analyze AIS data to evaluate risks and identify safety challenges in waterways</div> <div>5.3.1 Undesired scenario Risk Analysis</div> <div>5.3.2 Congestion and Traffic Patterns</div> <div>5.3.3 Environmental Risk Assessment</div> <div>5.3.4 Scenario Modeling</div>	<div>5.3.1 Undesired scenario Risk Analysis</div> <div>Identify and describe the different scenarios that can be assessed with the availability of AIS data Describe the root cause of the undesired scenario Use AIS data to calculate Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA)</div>	<div>5.3.2 Congestion and Traffic Patterns</div> <div>Identify high-risk zones for vessel interactions Congestion and Traffic Patterns:<ul style="list-style-type: none">Analyze traffic density and vessel movement patterns to assess congestion levelsIdentify bottlenecks and propose measures for improving traffic flow</div> <div>Analysis and determination of near-miss accidents</div>
<div>Module 6: AIS Service quality, policy and strategy</div>	<div>Competences:</div> <div>6.1 Manage and improve AIS service quality to meet operational and regulatory standards</div> <div>6.2 Formulate policies for the deployment and use of AIS services in alignment with international and national regulations</div> <div>6.3 Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks</div>	<div>6.1.1 Understanding AIS Service Quality Standards</div> <div>Identify international standards for AIS services (e.g., IMO, ITU, IALA guidelines) Define key performance indicators (KPIs) for AIS service quality, such as data accuracy, coverage, latency, and reliability</div>	<div>6.1.2 Monitoring and Evaluating AIS Service Performance</div> <div>Analyze AIS performance metrics and identify gaps or failures in service Use diagnostic tools to evaluate signal coverage, data integrity, and system availability</div>
	<div>Competence 6.1 Manage and improve AIS service quality to meet operational and regulatory standards</div> <div>6.1.1 Understanding AIS Service Quality Standards</div> <div>6.1.2 Monitoring and Evaluating AIS Service Performance</div> <div>6.1.3 Continuous Improvement of AIS Services</div>	<div>6.1.1 Understanding AIS Service Quality Standards</div> <div>Identify international standards for AIS services (e.g., IMO, ITU, IALA guidelines) Define key performance indicators (KPIs) for AIS service quality, such as data accuracy, coverage, latency, and reliability</div>	<div>6.1.2 Monitoring and Evaluating AIS Service Performance</div> <div>Analyze AIS performance metrics and identify gaps or failures in service Use diagnostic tools to evaluate signal coverage, data integrity, and system availability</div>
	<div>Competence 6.2 Formulate policies for the deployment and use of AIS services in alignment with international and national regulations</div> <div>6.2.1 Regulatory Frameworks for AIS Policy</div> <div>6.2.2 Policy Development</div> <div>6.2.3 Policy Implementation and Compliance</div>	<div>6.2.1 Regulatory Frameworks for AIS Policy</div> <div>Explain international conventions and regulations governing AIS (e.g., SOLAS, IMO guidelines) Identify national legal frameworks for AIS deployment and use</div>	<div>6.2.2 Policy Development</div> <div>Draft policies that define AIS implementation procedures, data-sharing protocols, and compliance requirements Address privacy, data security, and ethical considerations in AIS policy</div>
	<div>Competence 6.3 Design strategies to integrate AIS services into maritime safety, traffic management, and operational frameworks</div> <div>6.3.1 Strategic Integration of AIS Services</div> <div>6.3.2 Risk Management and Contingency Planning</div> <div>6.3.3 Innovation and Future Trends</div> <div>6.3.4 Stakeholder Engagement and Collaboration</div>	<div>6.3.1 Strategic Integration of AIS Services</div> <div>Develop frameworks for integrating AIS with other navigational tools (e.g., radar, VTS, ECDIS) Design strategies for optimizing AIS use in port operations and vessel traffic monitoring</div>	<div>6.3.2 Risk Management and Contingency Planning</div> <div>Identify risks associated with AIS system failure or misuse Develop contingency plans to ensure operational continuity during system outages</div>
References:		<div>MSC-MEPC.2/Circ.15/Rev.2 GUIDELINES FOR THE DEVELOPMENT, REVIEW AND VALIDATION OF MODEL COURSES</div> <div>Resolution A.1106 (29), Revised Guidelines for the onboard operational use of shipborne Automatic Identification Systems (AIS)</div> <div>Resolution MSC.74 (69), Recommendations on performance standards for a universal Shipborne Automatic Identification System (AIS)</div> <div>SN/Circ. 289, Guidance on the Use of AIS Application-Specific Messages</div> <div>Resolution MSC.191 (79), Performance Standards for the Presentation of Navigation Related Information on Shipborne Navigational Displays</div> <div>SOLAS Chapter V, as amended</div> <div>SN/Circ. 245, Amendments to the guidelines for the installation of a shipborne Automatic Identification System (AIS)</div>	