



## DEVELOPING FRAMEWORK FOR MARITIME SIMULATOR TRAINING

CoMET Project Report on Framework of Simulator-based Training for  
Receiving 30 Days of Seafaring Practice during  
Bachelor's Degree Level Maritime Studies

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## FOREWORD AND DISCLAIMER

This report is the summary of research and development carried out in CB714 CoMET project activity A.T3.1, funded by the Interreg Central Baltic Programme. It is the first draft of a framework of simulator-based training for receiving 30 days of seafaring practice during bachelor's degree level maritime studies. It can be further developed, adapted, and applied by other project partner academies. The main objective was to find a solution for arranging maritime simulator training according to applicable international and national legislation and pedagogical principles. Thus, this document should only be used for reference, when developing simulator training in other maritime education and training institutions.

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## 1 INTRODUCTION

This report is written as part of a project called Internationally competitive maritime education for modern seagoing and high quality port services (CB714 CoMET), which is funded by the European Regional Development Fund under the Interreg Central Baltic Programme. The aim of the project is to connect maritime simulator centres across the Baltic Sea. Simulator connectivity enables students to train within the same virtual learning environment, where multi-cultural communication and collaboration are integral parts of the training. The project also aims to create harmonized transboundary and transnational maritime simulator training framework enabling other vocational and higher professional maritime education and training providers to use it as a base for future development, adaptation and application in their respective organizations.

This report is implemented within CoMET project work package T3: Establishing maritime and cargo handling training programmes. The purpose of the report is the development of a framework, which enables maritime students to receive seafaring experience in a simulator allowed by the requirements of maritime administration responsible. The framework is based on the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention) including the annexes (STCW Code), as amended, and *the Finnish Council of State's Decree Regarding the Manning of Vessels and Certification of Seafarers (508/2018), as amended. (translated from Finnish)*

Finnish law permits operational and management level maritime students to complete no more than one month long simulator training included in mandatory seagoing service required in applying for a Deck Officer Certificate of Competency (STCW A-II/1). Additionally, the duration of a single simulator training day must be at least six hours to correspond to an on-board training day. This creates a foundation for the framework of simulator-based training for receiving 30 days of seafaring practice during bachelor's degree level maritime studies. It should be observed that the application procedure for certificates of competency may be different in other countries, so applicable national legislation should always be examined and complied with.

The first chapter of this report introduces the purpose and legislative context for creating the framework for maritime simulator training. It also gives advice on fulfilling the requirements for teaching arrangements. The second chapter reveals the actual framework, which may freely be used by other maritime academies and training providers either fully or partly as they see fit. It may also be adjusted and modified to suit their respective curriculums or training schemes. The aim of the framework is to harmonize maritime simulator training in project partner academies in Finland and Estonia but hopefully also in other countries as well.

Please note that this report and the framework should only be used as reference in the development of simulator training in other maritime education and training institutions. The authors or South-Eastern Finland University of Applied Sciences do not accept any liability or responsibility for loss or damages resulting from any use of this document. The framework only supplements training in specific subject areas of bridge operation, and it does not completely satisfy all the STCW standards of competence regarding the master and deck department.

## 2 PURPOSE AND USE OF THE FRAMEWORK

The purpose of this report is the development of a framework for maritime simulator training, which enables maritime students to receive 30 days of seafaring practice during studies. The basis of the framework are the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention) including the annexes (STCW Code), as amended, which define the minimum standards of competence required for seagoing personnel. It is mainly created for bachelor's degree level maritime studies, where curriculums consist of support (STCW A-II/4), operational (STCW A-II/1) and management (STCW A-II/2) level education and training. The actual framework only supplements maritime training in fulfilling the competency requirements of Section A-II/1 and A-II/2 of the STCW Code.

The foundation of the framework is based on the Finnish law governing the training and certification of seafarers. Here applicable are *the Law for Traffic Services (24.5.2017/320)*, *Law for Seafarers and Ship Safety Management (29.12.2009/1687)* and especially *the Finnish Council of State's Decree Regarding the Manning of Vessels and Certification of Seafarers (508/2018)*, as amended. (translated from Finnish) The latter is pursuant to the prior laws and permits maritime students to complete no more than one month long training in a simulator included in compulsory seagoing service when applying for a Deck Officer Certificate of Competency (STCW A-II/1). Therefore, the framework is mainly intended to be applied in training of operational and management level maritime students in Finland. It is acknowledged that the applicable legislation in other countries may differ, so the corresponding national law should always be observed before using the framework in any development of maritime simulator training.

### 2.1 SIMULATOR TRAINING AND THE STCW CODE

Minimum standards of competence that have to be met by seafarers are defined in Part A of the STCW Code. The framework is developed according to the Manila Amendments to address:

- Table A-II/1: Specification of minimum standard of competence for officers in charge of a navigational watch on ships of 500 gross tonnage or more
- Table A-II/2: Specification of minimum standard of competence for masters and chief mates on ships of 500 gross tonnage or more.

Each minimum standard of competence has Functions as follows:

- Navigation at the operational level/management level
- Cargo handling and stowage at the operational level/management level
- Controlling the operation of the ship and care for persons on board at the operational level/management level.

The framework covers two Functions: Navigation at the operational and management level where applicable to approved simulator training or simulation. Use the IMO Standard Marine Communication Phrases and use English in written and oral form; forecast weather and oceanographic conditions; and respond to navigational emergencies are omitted, since their competency cannot be demonstrated in simulator training or simulation. Additionally, use of radar and ARPA to maintain safety of navigation; and use of ECDIS to maintain the safety of navigation are only partially included, since Radar/ARPA and ECDIS are covered

in their respective training courses outside the scope of the framework. However, the training of all these competencies may be incorporated in simulator training or simulation where appropriate in order to enhance the learning experience.

The framework aims to help in effectively implementing the STCW Convention and the Knowledge, Understanding and Proficiency (KUP) requirements of the STCW Code in maritime simulator training. Its purpose is guidance only, and it should not be regarded as an official interpretation in satisfying the minimum standards of competency set out in the STCW Code Part A Table A-II/1 Function: Navigation at the operational level; and Table A-II/2 Function: Navigation at the management level. Its objective is to unify simulator-based training nationally and internationally by providing a flexible solution, which can be further developed, adapted, and applied by other maritime academies and training providers to suit the needs of students or trainees based on their previous education and work experience.

It is emphasized that the STCW Convention and Code, as amended, set the general requirements regarding seafarers training, certification and watchkeeping. Mandatory provisions concerning training and assessment including qualifications of instructors, supervisors, and assessors; in service training; assessment of competence; and training and assessment within an institution are given in Section A-I/6 of the STCW Code. Additionally, standards governing the use of simulators are given in Section A-I/12 of the STCW Code. Corresponding Part B of the STCW Code gives guidance on these issues. The applicable standards and guidelines stated in the STCW Code should always be followed when using the framework in any development of maritime simulator training.

## 2.2 SIMULATOR TRAINING AND THE FINNISH LAW

Minimum requirements that have to be met by seafarers when applying for certificates of competency in Finland are defined in *the Finnish Council of State's Decree 508/2018, as amended in 411/2020. (translated from Finnish)* The framework is developed according to the provisions for issuing the Deck Officer Certificate of Competency in 24 § of the Decree:

- 1) *at least 18 years of age*
- 2) *deck officer training pursuant to Section A-II/1 of the STCW Code;*
- 3) *seagoing service:*
  - a) *as part of deck officer training intended in Item 2 at least 12 months of supervised training in deck department on an international traffic ship of 500 gross tonnage or more; or*
  - b) *at least 36 months in deck department on an international traffic ship of 500 gross tonnage or more.*

*The seagoing service intended in above Clause 1 Item 3 must include at least six months of watchkeeping related tasks in the bridge supervised by deck officers.*

*The supervised training intended in above Clause 1 Item 3 a can partly be completed in one or more following methods in deck department provided that the training is entered in an approved supervised training record book:*

- 1) *no more than one month long approved training in a simulator. Six hour long simulator training corresponds to one seagoing service day;*



- 2) no more than two months long training in a training vessel of 15 metres or more;
- 3) no more than one month long training in a domestic traffic vessel of 500 gross tonnage or more;
- 4) no more than two months long training from national service.

(translated from Finnish)

The framework is addressed to the training in a simulator intended in Clause 1 Item 3 a Sub-Clause 1 as part of deck officer training intended in Clause 1 Item 2 of the Decree. In other words, it covers 30 days of simulator training, which may be included in bachelor's degree level maritime curriculums in Finland. As a result of the framework the graduates are eligible to include the maximum amount of simulator training as seagoing service as part of the mandatory 12 months of supervised on-board training during maritime studies.

It is emphasized that the framework is developed according to the conditions set out in *the Finnish Council of State's Decree 508/2018, as amended in 411/2020. (translated from Finnish)* It can be fully adopted in Finnish higher professional and partly in lower vocational maritime education and training. Maritime academies and training providers in other countries may also benefit from it but the applicable national legislation should always be adhered to when using the framework in any development of maritime simulator training.

## 2.3 TEACHING REQUIREMENTS

Instructors, supervisors and assessors should be appropriately qualified for the particular types and levels of training or assessment of competence of seafarers according to Section A-I/6 of the STCW Code. Additionally, the instructors should have good knowledge in the following subject areas in order to support students' or trainees' learning in a proper way:

- pedagogical knowledge and experience about teaching, simulator training and simulation
- simulator's model and instructor system
- subject area of bridge operation.

When determining the number of instructors required for simulator training, the following aspects should at least be considered:

- number of students or trainees and their previous education and work experience
- type and level of training
- available teaching facilities and equipment
- usability of the simulator's model and instructor system
- amount of simultaneous instructor tasks.

It should be acknowledged that simulator training objectives, training and assessment procedures, and qualifications of instructor and assessors should meet the provisions stated in Section A-I/12 Part 2 of the STCW Code. Additionally, any simulator training and exercise should consist of briefing including preparations for simulation, simulation, and debriefing including evaluation and assessment of students' or trainees' progress and competence. The framework only presents an example outline for arranging 30 days of supervised simulator training, but it does not provide detailed training models or guidelines.

## 2.4 TEACHING FACILITIES AND EQUIPMENT

A navigational simulator is a training tool, which can realistically simulate the function area bridge operation. It should be acknowledged that any simulator used for simulator-based training or assessment of student's or trainee's competence should meet the performance standards according to Section A-I/12 Part 1 of the STCW Code. Additionally, it is advised that the simulator also complies with the requirements stated in Section 3 of the Standard DNVGL-ST-0033 Maritime simulator systems.



### 3 FRAMEWORK FOR MARITIME SIMULATOR TRAINING

This framework only describes one possible solution for arranging maritime simulator training according to the minimum standards of competency that have to be met by seafarers, as defined in the STCW Code Part A Table A-II/1 and A-II/2, and the minimum requirements that have to be met by seafarers when applying for certificates of competency in Finland, as defined in *the Finnish Council of State's Decree 508/2018, as amended in 411/2020. (translated from Finnish)*. Pedagogical principles in teaching are also applied to the recommended applications of training, which can be developed based on the information provided in this document.

The framework comprises of multiple tables, which are meant to be cross-referenced with each other to form a complete picture. The first table introduces an example outline for simulator training, which enables trainees to receive 30 days of seafaring practice during bachelor's degree level maritime studies. This is followed by simulator training day references assigned to Tables A-II/1 and A-II/2 of the STCW Code. The last remaining tables contain simple course outlines, which include recommendations for simulator training day contents and tasks in specific subject areas of bridge operation. Additionally, it should be recognized that all simulator training is based on prior STCW Table A-II/1 and A-II/2 studies.

#### 3.1 STRUCTURE OF THE FRAMEWORK

This framework consists of the following parts:

- Simulator training outline (Table 1)
- Application to the STCW Tables
  - References to the STCW Table A-II/1
  - References to the STCW Table A-II/2
- Simulator training courses
  - Introduction to simulator training (Table 2)
  - Simulator training at the operational level 1 (Table 3)
  - Simulator training at the operational level 2 (Table 4)
  - Simulator training at the management level 1 (Table 5)
  - Simulator training at the management level 2 (Table 6).

#### 3.2 SIMULATOR TRAINING OUTLINE

This framework provides an outline for maritime simulator training in below Table 1. It consists of five (5) courses, which enable trainees to receive 30 days of seafaring practice during bachelor's degree level maritime studies. The courses are identified by name, level of training and amount of simulator training days. Each simulator training day is numbered from 1 to 30, so that it can be directly referenced in the following Tables A-II/1 and A-II/2 of the STCW Code to check addressed competencies. Main topic or subject area of each simulator training day is given after the number. More detailed information regarding the simulator training courses and days can be seen in tables 2–6.

Table 1. Training outline

<b>INTRODUCTION TO SIMULATOR TRAINING (STCW A-II/1)</b> <i>3 simulator training days</i>
1. Supervised simulator training in navigational simulator 2. Basic use of bridge equipment and systems 3. Basic use of radar
<b>SIMULATOR TRAINING AT THE OPERATIONAL LEVEL 1 (STCW A-II/1)</b> <i>7 simulator training days</i>
4. Terrestrial and radar navigation techniques 5. Basic ship manoeuvring and handling in deep waters 6. Basic bridge watchkeeping procedures in open sea and coastal waters 7. Plan and execute ship turning in coastal fairways 8. Plan and conduct a passage in coastal and pilotage waters 9. Navigation in coastal and archipelagic fairways 10. Competence test (officers in charge of a navigational watch level)
<b>SIMULATOR TRAINING AT THE OPERATIONAL LEVEL 2 (STCW A-II/1)</b> <i>6 simulator training days</i>
11. Navigation in traffic separation schemes 12. Ship manoeuvring and handling in shallow waters 13. Bridge watchkeeping procedures in coastal VTS areas 14. Plan and conduct a passage in archipelagic waters 15. Navigation in archipelagic and restricted fairways 16. Respond to emergencies and distress signals
<b>SIMULATOR TRAINING AT THE MANAGEMENT LEVEL 1 (STCW A-II/1 &amp; STCW A-II/2)</b> <i>7 simulator training days</i>
17. Plan passages and conduct navigation 18. Intermediate ship manoeuvring and handling in restricted and shallow waters 19. Ship manoeuvring and anchoring in VTS areas 20. Ship manoeuvring and hydrodynamic interaction effects 21. Arrival to and departure from port 22. Ship manoeuvring and handling in challenging conditions 23. Competence test (first mates' level)
<b>SIMULATOR TRAINING AT THE MANAGEMENT LEVEL 2 (STCW A-II/2)</b> <i>7 simulator training days</i>
24. Plan voyages and conduct navigation 25. Pilot boarding, MRM and leadership skills 26. Advanced ship handling, berthing and unberthing 27. Ship and tug interaction and towing operations 28. Respond to navigational emergencies and faults 29. Search and rescue operations 30. Competence test (masters' level)

### 3.3 APPLICATION TO THE STCW TABLES

This framework adds simulator training day references to the following Tables of the STCW Code:

- STCW Table A-II/1 Function: Navigation at the operational level
- STCW Table A-II/2 Function: Navigation at the management level.

The references indicated in Column Training day together with course outlines in Tables 2–6 show recommended applications of training using a navigational simulator to “Competence” and “Knowledge, understanding and proficiency (KUP)” with

- “approved simulator training, where appropriate”
- “approved radar simulator and ARPA simulator”
- “approved ECDIS simulator training”
- “assessment of evidence obtained from simulation”

as an option of “Methods for demonstrating competence” described in Tables A-II/1 and A-II/2 of the STCW Code. Competences without above-mentioned matters are omitted and highlighted with non-bolded text in Column Competence of the reference tables below. Additionally, some references in Column Training day indicate to separate courses outside the scope of this document.

#### 3.3.1 REFERENCES TO THE STCW TABLE A-II/1

STCW Table A-II/1: Specification of minimum standard of competence for officers in charge of a navigational watch on ships of 500 gross tonnage or more

Function: Navigation at the operational level

Competence	Knowledge, understanding and proficiency	Training day
<b>1.1 Plan and conduct a passage and determine position</b>	<i>Celestial navigation</i>	
	Ability to use celestial bodies to determine the ship’s position	--
	<i>Terrestrial and coastal navigation</i>	
	Ability to determine the ship’s position by use of:	
	.1 landmarks	4–23
	.2 aids to navigation, including lighthouses, beacons and buoys	4–23
	.3 dead reckoning, taking into account winds, tides, currents and estimated speed	4–23

	Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routing information	2–23
	<i>Electronic systems of position fixing and navigation</i>	
	Ability to determine the ship's position by use of electronic navigational aids	2–23
	<i>Echo-sounders</i>	
	Ability to operate the equipment and apply the information correctly	2–23
	<i>Compass – magnetic and gyro</i>	
	Knowledge of the principles of magnetic and gyro-compasses	2–23
	Ability to determine errors of the magnetic and gyro-compasses, using celestial and terrestrial means, and to allow for such errors	4–23
	<i>Steering control system</i>	
	Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance	2–23
	<i>Meteorology</i>	
	Ability to use and interpret information obtained from ship-borne meteorological instruments	2–23
	Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems	8
	Ability to apply the meteorological information available	8–23
<b>1.2 Maintain a safe navigational watch</b>	<i>Watchkeeping</i>	
	Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended	6–23

	Thorough knowledge of the Principles to be observed in keeping a navigational watch	6–23
	The use of routeing in accordance with the General Provisions on Ships' Routeing	8–11, 13–17 & 19–21
	The use of information from navigational equipment for maintaining a safe navigational watch	2–23
	Knowledge of blind pilotage techniques	6–11, 13–17 & 19–21
	The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures	8–11, 13–17, 19–21 & 23
	<i>Bridge resource management</i>	
	Knowledge of bridge resource management principles, including:	
	.1 allocation, assignment, and prioritization of resources	6–23
	.2 effective communication	6–23
	.3 assertiveness and leadership	6–23
<b>1.3 Use of radar and ARPA to maintain safety of navigation</b>	.4 obtaining and maintaining situational awareness	6–23
	.5 consideration of team experience	6–23
	<i>Radar navigation</i>	
	Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)	Radar/ARPA course & 3–23
	Ability to operate and to interpret and analyse information obtained from radar, including the following:	Radar/ARPA course
	Performance, including:	
	.1 factors affecting performance and accuracy	3–23
	.2 setting up and maintaining displays	3–23
	.3 detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs	3–23

	<p>Use, including:</p> <ul style="list-style-type: none"> <li>.1 range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships</li> <li>.2 identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both</li> <li>.3 application of the International Regulations for Preventing Collisions at Sea, 1972, as amended</li> <li>.4 plotting techniques and relative- and true motion concepts</li> <li>.5 parallel indexing</li> </ul> <p>Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA</p> <p>Ability to operate and to interpret and analyse information obtained from ARPA, including:</p> <ul style="list-style-type: none"> <li>.1 system performance and accuracy, tracking capabilities and limitations, and processing delays</li> <li>.2 use of operational warnings and system tests</li> <li>.3 methods of target acquisition and their limitations</li> <li>.4 true and relative vectors, graphic representation of target information and danger areas</li> <li>.5 deriving and analysing information, critical echoes, exclusion areas and trial manoeuvres</li> </ul>	<p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>7–11, 13–17 &amp; 19–21</p> <p>Radar/ARPA course, 11, 13–17 &amp; 19–21</p> <p>Radar/ARPA course</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p> <p>11, 13–17 &amp; 19–21</p>
<b>1.4 Use of ECDIS to maintain the safety of navigation</b>	<p><i>Navigation using ECDIS</i></p> <p>Knowledge of the capability and limitations of ECDIS operations, including:</p> <ul style="list-style-type: none"> <li>.1 a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats</li> </ul>	<p>ECDIS course &amp; 17–23</p>

	<p>.2 the dangers of over-reliance</p> <p>.3 familiarity with the functions of ECDIS required by performance standards in force</p> <p>Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including:</p> <p>.1 use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings</p> <p>.2 safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)</p> <p>.3 confirmation of vessel position by alternative means</p> <p>.4 efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements</p> <p>.5 adjustment of settings and values to suit the present conditions</p> <p>.6 situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors</p>	ECDIS course & 17–23
<b>1.5 Respond to emergencies</b>	<p><i>Emergency procedures</i></p> <p>Precautions for the protection and safety of passengers in emergency situations</p> <p>Initial action to be taken following a collision or a grounding; initial damage assessment and control</p>	<p>--</p> <p>--</p>



	Appreciation of the procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port	5 & 16
<b>1.6 Respond to a distress signal at sea</b>	<i>Search and rescue</i>  Knowledge of the contents of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual	16
<b>1.7 Use the IMO Standard Marine Communication Phrases and use English in written and oral form</b>	<i>English language</i>  Adequate knowledge of the English language to enable the officer to use charts and other nautical publications, to understand meteorological information and messages concerning ship's safety and operation, to communicate with other ships, coast stations and VTS centres and to perform the officer's duties also with a multilingual crew, including the ability to use and understand the IMO Standard Marine Communication Phrases (IMO SMCP)	Omitted
<b>1.8 Transmit and receive information by visual signalling</b>	<i>Visual signalling</i>  Ability to use the International Code of Signals  Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals	2 & 16  2
<b>1.9 Manoeuvre the ship</b>	<i>Ship manoeuvring and handling</i>  Knowledge of:  .1 the effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distances  .2 the effects of wind and current on ship handling  .3 manoeuvres and procedures for the rescue of person overboard  .4 squat, shallow-water and similar effects  .5 proper procedures for anchoring and mooring	5–23  9–23  5 & 16  7–10 & 12–23  8, 19 & 21

### 3.3.2 REFERENCES TO THE STCW TABLE A-II/2

STCW Table A-II/2: Specification of minimum standard of competence for masters and chief mates on ships of 500 gross tonnage or more

Function: Navigation at the management level

Competence	Knowledge, understanding and proficiency	Training day
<b>2.1 Plan a voyage and conduct navigation</b>	<p>Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks taking into account, e.g.:</p> <ul style="list-style-type: none"> <li>.1 restricted waters</li> <li>.2 meteorological conditions</li> <li>.3 ice</li> <li>.4 restricted visibility</li> <li>.5 traffic separation schemes</li> <li>.6 vessel traffic service (VTS) areas</li> <li>.7 areas of extensive tidal effects</li> </ul> <p>Routeing in accordance with the General Provisions on Ships' Routeing</p> <p>Reporting in accordance with the General principles for Ship Reporting Systems and with VTS procedures</p>	<p>17, 19, 21, 24, 25 &amp; 28</p> <p>17, 21 &amp; 24</p> <p>--</p> <p>17, 21 &amp; 24</p> <p>17, 21 &amp; 28</p> <p>19, 21 &amp; 29</p> <p>--</p> <p>17, 21 &amp; 24</p> <p>19, 21 &amp; 29</p>
<b>2.2 Determine position and the accuracy of resultant position fix by any means</b>	<p>Position determination in all conditions:</p> <ul style="list-style-type: none"> <li>.1 by celestial observations</li> <li>.2 by terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting position fix</li> <li>.3 using modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing</li> </ul>	<p>--</p> <p>17, 19–21, 24–25 &amp; 28–29</p> <p>17, 19–21, 24–25 &amp; 28–29</p>

<b>2.3 Determine and allow for compass errors</b>	Ability to determine and allow for errors of the magnetic and gyro-compasses	28
	Knowledge of the principles of magnetic and gyro-compasses	28
	An understanding of systems under the control of the master gyro and a knowledge of the operation and care of the main types of gyro-compass	28
<b>2.4 Coordinate search and rescue operations</b>	A thorough knowledge of and ability to apply the procedures contained in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual	29
<b>2.5 Establish watch-keeping arrangements and procedures</b>	Thorough knowledge of content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended	17, 19–21, 24–25 & 28–29
	Thorough knowledge of the content, application and intent of the Principles to be observed in keeping a navigational watch	17, 21, 24–25 & 28
<b>2.6 Maintain safe navigation through the use of information from navigation equipment and systems to assist command decision making</b>	An appreciation of system errors and thorough understanding of the operational aspects of navigational systems	17, 19, 21, 24 & 28
	Blind pilotage planning	17, 21 & 24
	Evaluation of navigational information derived from all sources, including radar and ARPA, in order to make and implement command decisions for collision avoidance and for directing the safe navigation of the ship	17, 19, 21 & 28
	The interrelationship and optimum use of all navigational data available for conducting navigation	17, 19, 21, 24 & 28
<b>2.7 Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making</b>	<p>Management of operational procedures, system files and data, including</p> <p>.1 manage procurement, licensing and updating of chart data and system software to conform to established procedures</p> <p>.2 system and information updating, including the ability to update ECDIS system version in accordance with vendor's product development</p> <p>.3 create and maintain system configuration and backup files</p>	ECDIS course

	<p>.4 create and maintain log files in accordance with established procedures</p> <p>.5 create and maintain route plan files in accordance with established procedures</p> <p>.6 use ECDIS log-book and track history functions for inspection of system functions, alarm settings and user responses</p> <p>Use ECDIS playback functionality for passage review, route planning and review of system functions</p>	ECDIS course
2.8 Forecast weather and oceanographic conditions	<p>Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax</p> <p>Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants</p> <p>Knowledge of ocean current systems</p> <p>Ability to calculate tidal conditions</p> <p>Use all appropriate nautical publications on tides and currents</p>	<p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p>
2.9 Respond to navigational emergencies	<p>Precautions when beaching a ship</p> <p>Action to be taken if grounding is imminent, and after grounding</p> <p>Refloating a grounded ship with and without assistance</p> <p>Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause</p> <p>Assessment of damage control</p> <p>Emergency steering</p> <p>Emergency towing arrangements and towing procedure</p>	<p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p> <p>Omitted</p>

<b>2.10 Manoeuvre and handle a ship in all conditions</b>	<p>Manoeuvring and handling a ship in all conditions, including:</p> <p>.1 manoeuvres when approaching pilot stations and embarking or disembarking pilots, with due regard to weather, tide, headreach and stopping distances</p> <p>.2 handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response</p> <p>.3 application of constant rate-of-turn techniques</p> <p>.4 manoeuvring in shallow water, including the reduction in under-keel clearance caused by squat, rolling and pitching</p> <p>.5 interaction between passing ships and between own ship and nearby banks (canal effect)</p> <p>.6 berthing and unberthing under various conditions of wind, tide and current with and without tugs</p> <p>.7 ship and tug interaction</p> <p>.8 use of propulsion and manoeuvring systems</p> <p>.9 choice of anchorage; anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used</p> <p>.10 dragging anchor; clearing fouled anchors</p> <p>.11 dry-docking, both with and without damage</p> <p>.12 management and handling of ships in heavy weather, including assisting a ship or aircraft in distress; towing operations; means of keeping an unmanageable ship out of trough of the sea, lessening drift and use of oil</p> <p>.13 precautions in manoeuvring to launch rescue boats or survival craft in bad weather</p> <p>.14 methods of taking on board survivors from rescue boats and survival craft</p>	<p>25</p> <p>20 &amp; 26</p> <p>17, 19, 21 &amp; 24</p> <p>20</p> <p>20</p> <p>22 &amp; 26</p> <p>27</p> <p>18–19, 22 &amp; 25–26</p> <p>19</p> <p>--</p> <p>--</p> <p>(28)</p> <p>(29)</p> <p>--</p>
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	.15 ability to determine the manoeuvring and propulsion characteristics of common types of ships, with special reference to stopping distances and turning circles at various draughts and speeds	18, 22 & 26
	.16 importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave	19
	.17 practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board	--
	.18 use of, and manoeuvring in and near, traffic separation schemes and in vessel traffic service (VTS) areas	17, 19 & 21
<b>2.11 Operate remote controls of propulsion plant and engineering systems and services</b>	Operating principles of marine power plants	--
	Ships' auxiliary machinery	--
	General knowledge of marine engineering terms	--

### 3.4 SIMULATOR TRAINING COURSES

This framework provides outlines in below Tables 2–6 for the following simulator training courses:

- Introduction to simulator training
- Simulator training at the operational level 1
- Simulator training at the operational level 2
- Simulator training at the management level 1
- Simulator training at the management level 2.

The outlines include course and training day information with recommendations for course arrangements and training day contents and tasks, which all can be further developed, adapted, and applied by other project partner academies or maritime education and training institutions. However, it should be acknowledged that the recommended applications of training described in this document are designed to be completed during bachelor's degree level maritime studies.

#### 3.4.1 INTRODUCTION TO SIMULATOR TRAINING

Course outline for simulator training days 1–3 is described in below Table 2. This is mainly intended to be used by the instructors for planning and executing the training.

Table 2. Course outline

COURSE INFORMATION	
<b>Level of training:</b>	STCW Table A-II/1 Function: Navigation at the operational level
<b>Course name:</b>	Introduction to simulator training
<b>Course objective:</b>	Knowledge, understanding of, and proficiency in <ul style="list-style-type: none"> <li>• learning practical skills and completing approved simulator training based on prior STCW Table A-II/1 studies</li> </ul>
<b>Recommended number of simulator training days:</b>	3
<b>Recommended duration for a single simulator training day:</b>	8 hours including lunch and breaks
TRAINING DAY INFORMATION	
<b>1. Supervised simulator training in navigational simulator</b>	
1.1. Maritime simulators	<ul style="list-style-type: none"> <li>• Listening to introduction</li> <li>• Comprehending definition of simulator</li> <li>• Acknowledging performance standards for simulators used in training and assessment</li> <li>• Identifying different types of maritime simulators</li> </ul>
1.2. Navigational simulators and supervised simulator training	<ul style="list-style-type: none"> <li>• Identifying different simulator classes for bridge operation</li> <li>• Acknowledging provisions for approved simulator training</li> <li>• Distinguishing supervised simulator training during studies</li> </ul>



1.3. Simulator training methodology and pedagogy

- Comprehending definition of simulator training and simulation
- Recognizing key factors in simulator training and simulation-based learning
- Understanding concept of learning objectives
- Acknowledging rules and regulations for supervised simulator training
- Acknowledging procedures and guidelines for supervised simulator training
- Acknowledging procedures and guidelines for students' or trainees' evaluation and assessment

1.4. Familiarization with navigational simulator in a workstation environment

- Identifying arrangement and controls of a limited or special task simulator
- Comprehending structure of conning user interface
- Finding and familiarizing with controls of display adjustment
- Finding and interpreting exercise information
- Finding and interpreting ship particulars
- Finding and interpreting shipborne meteorological instruments
- Finding and familiarizing with controls of viewing direction, binoculars and bearing device
- Finding and familiarizing with controls of main engine and steering gear
- Finding and interpreting ship manoeuvring indicators
- Finding and interpreting ship motion parameters
- Finding and distinguishing between different navigational aids and instruments
- Finding and distinguishing between different signalling equipment
- Finding and distinguishing between different ship alarm systems
- Finding and distinguishing between different mooring and anchoring systems
- Finding and distinguishing between different search and rescue equipment

1.5. Familiarization with navigational simulator in a bridge environment

- Identifying arrangement and controls of a multitask or full mission simulator

**2. Basic use of bridge equipment and systems**

2.1. Preparations of navigational simulator for sea

- Finding and distinguishing between different nautical charts and publications
- Finding and interpreting Pilot Card and Wheelhouse Poster
- Finding and familiarizing with magnetic compass and determining magnetic deviation and variation
- Finding and familiarizing with gyro compass and determining gyro error
- Finding and familiarizing with echo sounder, speed log, GPS and AIS and their controls, functions and settings
- Finding and familiarizing with main engine controls and operation indicators
- Finding and familiarizing with emergency main engine controls
- Finding and familiarizing with emergency electrical plant controls
- Finding and familiarizing with rudder controls and operation indicators
- Finding and familiarizing with emergency rudder controls
- Finding and familiarizing with thruster controls and operation indicators
- Finding and familiarizing with rudder control mode selector

- Finding and familiarizing with autopilot and its controls, functions and settings
- Finding and familiarizing with lights, shapes and sound signals
- Familiarizing with giving Morse code sound or light signals
- Finding and familiarizing with bridge lifebuoy release
- Finding and familiarizing with flags
- Familiarizing with giving shipboard alarms
- Finding and familiarizing with fire control system
- Finding and familiarizing with ship alarm monitoring system
- Finding and familiarizing with moor and anchor controls
- Familiarizing with giving distress signals
- Familiarizing with filling checklist for preparations for sea
- Completing tasks for preparing navigational simulator for sea

## 2.2. Use of navigational simulator at sea

- Completing tasks for using navigational simulator at sea

## 3. Basic use of radar

### 3.1. Familiarization with radar in a workstation environment

- Identifying radar controls of a limited or special task simulator
- Comprehending structure of radar user interface
- Finding and familiarizing with controls of display adjustment
- Familiarizing with turning radar on/off
- Familiarizing with checking radar operation and navigational status
- Familiarizing with different scanner controls
- Familiarizing with performing radar initial setup
- Familiarizing with adjusting plan position indicator
- Familiarizing with obtaining different navigational information from radar
- Familiarizing with different cursor functions
- Familiarizing with using electronic bearing lines and variable range markers
- Familiarizing with interpreting radar display compared to a nautical chart
- Familiarizing with recognizing different objects in radar display and from a nautical chart
- Familiarizing with measuring range and bearing to a single object
- Familiarizing with measuring tangent bearing to a single object
- Familiarizing with measuring two or more bearings
- Familiarizing with measuring two or more ranges
- Familiarizing with utilizing index lines and range rings
- Familiarizing with different radar tools, functions and settings
- Familiarizing with different radar alerts
- Familiarizing with setting up and maintaining displays in different conditions
- Familiarizing with operating, interpreting and analysing different information obtained from radar
- Acknowledging factors affecting radar performance and accuracy
- Acknowledging dangers in misinterpretation of information obtained from radar
- Completing tasks for familiarizing with radar in a workstation environment

### 3.2. Familiarization with radar in a bridge environment

- Identifying radar controls of a multitask or full mission simulator
- Completing tasks for familiarizing with radar in a bridge environment

### 3.4.2 SIMULATOR TRAINING AT THE OPERATIONAL LEVEL 1

Course outline for simulator training days 4–10 is described in below Table 3. This is mainly intended to be used by the instructors for planning and executing the training.

Table 3. Course outline

COURSE INFORMATION	
<b>Level of training:</b>	STCW Table A-II/1 Function: Navigation at the operational level
<b>Course name:</b>	Simulator training at the operational level 1
<b>Course objective:</b>	Knowledge, understanding of, and proficiency in <ul style="list-style-type: none"> <li>• learning practical skills and completing approved simulator training based on prior STCW Table A-II/1 studies</li> </ul>
<b>Recommended number of simulator training days:</b>	7
<b>Recommended duration for a single simulator training day:</b>	8 hours including lunch and breaks
TRAINING DAY INFORMATION	
<b>4. Terrestrial and radar navigation techniques</b>	
4.1. Terrestrial navigation	<ul style="list-style-type: none"> <li>• Interpreting visual sightings compared to a nautical chart</li> <li>• Recognizing visible landmarks, navigational aids and other fixed objects visually and from a nautical chart</li> <li>• Using magnetic and/or gyro compass to determine ship course</li> <li>• Using speed log to determine ship speed and distance covered</li> <li>• Using bearing device to determine relative and true bearings to fixed objects</li> <li>• Making a visual fix</li> <li>• Plotting a line of position in a nautical chart</li> <li>• Making a position fix from a visual fix in a nautical chart</li> <li>• Utilizing estimated position and dead reckoning</li> <li>• Making a running fix in a nautical chart</li> <li>• Familiarizing with different visual and terrestrial position fixing techniques</li> <li>• Familiarizing with making entries of visual and terrestrial position fixes in a nautical chart and bridge logbook</li> <li>• Familiarizing with applying visual and terrestrial position fixing techniques to determine leeway</li> <li>• Completing tasks for conducting terrestrial navigation</li> </ul>
4.2. Radar navigation	

- Interpreting radar display compared to a nautical chart
- Recognizing landmarks, navigational aids, special radar aids to navigation and other fixed objects in radar display and from a nautical chart
- Using electronic bearing lines and variable range markers to determine true bearings and ranges to fixed objects
- Utilizing index lines and range rings
- Making a radar fix
- Plotting a line and arc of position in a nautical chart
- Making a position fix from a radar fix in a nautical chart
- Familiarizing with different radar position fixing techniques
- Familiarizing with making entries of radar position fixes in a nautical chart and bridge logbook
- Familiarizing with applying radar position fixing techniques to determine set and drift
- Completing tasks for conducting radar navigation

## **5. Basic ship manoeuvring and handling in deep waters**

### **5.1. Ship manoeuvring in open sea**

- Interpreting ship manoeuvring and handling characteristics in deep water
- Acknowledging effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distances
- Planning and executing ship acceleration, deceleration and turning with different vessel types
- Planning and executing crash stop with different vessel types
- Planning and executing low frequency rudder cycling with different vessel types
- Completing tasks for manoeuvring the ship in open sea

### **5.2. Ship emergency and person overboard manoeuvres in coastal waters**

- Planning and executing emergency evasive manoeuvre
- Planning and executing Williamson turn
- Planning and executing Scharnow turn
- Planning and executing Anderson turn (Single turn)
- Planning and executing Double turn
- Completing tasks for conducting ship emergency and person overboard manoeuvres in coastal waters

## **6. Basic bridge watchkeeping procedures in open sea and coastal waters**

### **6.1. Maintain sole look-out in daylight and perform change of navigational watch**

- Acknowledging conditions for sole look-out in daylight
- Acknowledging principles for effective watch handover
- Acknowledging importance of familiarity with bridge layout and equipment
- Acknowledging importance of obtaining and maintaining situational awareness
- Familiarizing with conducting navigation and controlling the ship in open sea
- Familiarizing with monitoring the passage in open sea
- Familiarizing with making different entries in nautical charts and bridge logbook
- Filling checklist for change of watch at sea

- Completing tasks for maintaining sole look-out in daylight and performing change of navigational watch

#### 6.2. Maintain navigational watch in darkness

- Acknowledging conditions for bridge team composition
- Acknowledging Master's standing orders and different bridge checklists
- Acknowledging principles for effective leadership and teamwork
- Acknowledging importance of different bridge team roles, duties and experience
- Familiarizing with managing bridge watch and maintaining proper look-out
- Familiarizing with complying with the ColRegs
- Familiarizing with conducting navigation and controlling the ship in coastal waters
- Familiarizing with monitoring the passage in coastal waters
- Familiarizing with making different entries in nautical charts and bridge logbook
- Familiarizing with filling different bridge checklists
- Familiarizing with executing ship's internal communications and calling the master
- Completing tasks for maintaining navigational watch in darkness

### 7. Plan and execute ship turning in coastal fairways

#### 7.1. Ship manoeuvring in coastal fairways

- Interpreting ship manoeuvring characteristics in shallow water
- Acknowledging effects of shallow water on ship manoeuvring
- Determining safe speeds and turning circle radiuses for changes of course
- Drawing and plotting tracks and turning circles in a nautical chart
- Determining wheel-over points in a nautical chart
- Planning visual, terrestrial and radar fixes for wheel-over positions
- Preparing for automatic steering control and use of different turn modes
- Calculating rate of turn for changes of course
- Preparing for manual steering control and use of helmsman
- Planning suitable helm orders
- Familiarizing with preparing and executing a passage plan and route in coastal fairways
- Familiarizing with filling checklist for route planning
- Familiarizing with conducting navigation and controlling the ship in coastal fairways
- Familiarizing with monitoring the passage and maintaining planned speed in coastal fairways
- Using different visual, terrestrial and radar position fixing techniques
- Familiarizing with using blind pilotage and different parallel indexing techniques
- Familiarizing with using autopilot in radius and rate of turn modes
- Familiarizing with giving helm orders in rudder angle and rate of turn commands
- Completing tasks for manoeuvring the ship in coastal fairways

### 8. Plan and conduct a passage in coastal and pilotage waters

#### 8.1. Preparation and execution of a passage plan in coastal and pilotage waters

- Acknowledging requirements and recommendations for passage planning in coastal and pilotage waters
- Conducting appraisal of a passage plan

- Acquiring and using applicable nautical charts and publications
- Acquiring and utilizing available maritime safety and weather information
- Acquiring and utilizing available information on ship's routing and reporting systems
- Acquiring and utilizing available information on vessel traffic services and pilotage procedures
- Drawing and plotting routes in nautical charts
- Transferring positions between nautical charts
- Identifying and indicating navigational hazards in nautical charts
- Determining under-keel clearances
- Planning an anchorage
- Preparing the passage plan and route
- Filling checklist for route planning
- Conducting check and approval of the passage plan
- Making amendments to routes
- Conducting briefing of the passage plan
- Filling checklist for preparations for sea
- Executing the passage plan and route
- Complying with the ColRegs
- Conducting navigation and controlling the ship in coastal and pilotage waters
- Monitoring the passage and maintaining planned speed in coastal and pilotage waters
- Making different entries in nautical charts and bridge logbook
- Familiarizing with executing ship's reporting
- Completing tasks for preparing and executing a passage plan

## **9. Navigation in coastal and archipelagic fairways**

### **9.1. Navigation in coastal fairways during daylight**

- Acknowledging requirements and recommendations for passage planning in coastal fairways
- Acknowledging importance of passing charted and other features at a safe distance
- Acquiring and using applicable sailing directions
- Acquiring and utilizing available information on inshore traffic zones and fairways
- Acquiring and utilizing available information on water depth and tides
- Acquiring and utilizing available information on vessel traffic services and ship's routing and reporting measures
- Preparing and executing a passage plan and route in coastal fairways
- Complying with the ColRegs
- Conducting navigation and controlling the ship in coastal fairways
- Monitoring the passage and maintaining planned speed in coastal fairways
- Using different visual, terrestrial and radar position fixing techniques
- Using blind pilotage and different parallel indexing techniques
- Using autopilot in radius and rate of turn modes
- Giving helm orders in rudder angle and rate of turn commands
- Familiarizing with detecting and correcting effects of wind and/or current on ship handling



- Executing ship's reporting
  - Completing tasks for navigating in coastal fairways
- 9.2. Navigation in archipelagic fairways during daylight
- Acknowledging requirements and recommendations for passage planning in archipelagic fairways
  - Acknowledging local conditions, rules and restrictions on navigation
  - Acquiring and utilizing available information on archipelagic waters and sea lanes
  - Acquiring and utilizing available information on recommended routes and channels
  - Acquiring and utilizing available information on pilotage waters and procedures
  - Acquiring and utilizing available information on prospective berths and/or anchorages
  - Acquiring and utilizing available information on reporting and communications procedures
  - Preparing and executing a passage plan and route in archipelagic fairways
  - Complying with the ColRegs, especially regarding narrow channels
  - Conducting navigation and controlling the ship in archipelagic fairways
  - Monitoring the passage and maintaining planned speed in archipelagic fairways
  - Using different visual, terrestrial and radar position fixing techniques
  - Using blind pilotage and different parallel indexing techniques
  - Using autopilot in radius and rate of turn modes
  - Giving helm orders in rudder angle and rate of turn commands
  - Detecting and correcting effects of wind and/or current on ship handling
  - Executing ship's reporting
  - Completing tasks for navigating in archipelagic fairways

#### 10. Competence test (officers in charge of a navigational watch level)

- 10.1. Plan and conduct a passage in coastal and archipelagic fairways
- Completing tasks for evaluating and assessing students' or trainee's progress and competence in previously practised subject areas during simulator training days 4–9

### 3.4.3 SIMULATOR TRAINING AT THE OPERATIONAL LEVEL 2

Course outline for simulator training days 11–16 is described in below Table 4. This is mainly intended to be used by the instructors for planning and executing the training.

Table 4. Course outline

COURSE INFORMATION
<b>Level of training:</b> STCW Table A-II/1 Function: Navigation at the operational level
<b>Course name:</b> Simulator training at the operational level 2
<b>Course objective:</b>



Knowledge, understanding of, and proficiency in

- learning practical skills and completing approved simulator training based on prior STCW Table A-II/1 studies

**Recommended number of simulator training days: 6**

**Recommended duration for a single simulator training day: 8 hours including lunch and breaks**

## TRAINING DAY INFORMATION

### 11. Navigation in traffic separation schemes

#### 11.1. Joining, using and leaving traffic lanes

- Acknowledging requirements and recommendations for passage planning through traffic separation schemes
- Preparing and executing a passage plan and route through traffic separation scheme
- Complying with the ColRegs, especially regarding traffic separation schemes
- Conducting navigation and controlling the ship through traffic separation scheme
- Monitoring the passage and maintaining planned speed through traffic separation scheme
- Identifying and analysing traffic conditions
- Recognizing and analysing overtaking situations
- Applying the ColRegs in overtaking situations
- Determining risk of collision
- Executing actions to avoid a close encounter or collision
- Completing tasks for joining, using and leaving traffic lanes

#### 11.2. Crossing traffic lanes

- Acknowledging requirements and recommendations for passage planning across traffic separation schemes
- Preparing and executing a passage plan and route across traffic separation scheme
- Complying with the ColRegs, especially regarding traffic separation schemes
- Conducting navigation and controlling the ship across traffic separation scheme
- Monitoring the passage and maintaining planned speed across traffic separation scheme
- Identifying and analysing traffic conditions
- Using different radar target acquisition techniques
- Using automatic radar plotting aids
- Identifying and analysing critical echoes
- Recognizing and analysing crossing situations
- Applying the ColRegs in crossing situations
- Determining risk of collision
- Executing actions to avoid a close encounter or collision
- Completing tasks for crossing a traffic separation scheme

### 12. Ship manoeuvring and handling in shallow waters

#### 12.1. Ship manoeuvring in restricted waters

- Interpreting ship manoeuvring and handling characteristics in shallow water
- Acknowledging effects of shallow water on ship manoeuvring and handling
- Planning and executing normal stop with different vessel types

- Planning and executing high frequency rudder cycling with different vessel types
- Planning and executing turn of the ship at its position by using propulsion and steering or thruster(-s), and by combining both methods with different vessel types
- Manoeuvring sideways by using propulsion, steering and thruster(-s) with different vessel types
- Completing tasks for manoeuvring the ship in restricted waters

### **13. Bridge watchkeeping procedures in coastal VTS areas**

#### **13.1. Maintain navigational and radio watch in coastal VTS areas**

- Acknowledging duties of the officer of the watch
- Acknowledging requirements for radio watchkeeping
- Acknowledging importance of bridge team leadership and resource management
- Preparing and executing a passage plan and route in coastal VTS areas
- Complying with the ColRegs, especially regarding traffic separation schemes
- Managing bridge watch and maintaining proper look-out
- Conducting navigation and controlling the ship in coastal VTS areas
- Monitoring the passage and maintaining planned speed in coastal VTS areas
- Making different entries in nautical charts and bridge logbook
- Familiarizing with monitoring the performance of navigational and communications equipment
- Familiarizing with responding to equipment failures and malfunctions
- Familiarizing with recording different bridge activities
- Filling different bridge checklists
- Executing ship's reporting
- Familiarizing with executing routine and general radio communications with other vessels
- Executing ship's internal communications and calling the master
- Completing tasks for maintaining navigational and radio watch in coastal VTS areas

### **14. Plan and conduct a passage in archipelagic waters**

#### **14.1. Preparation and execution of a passage plan in archipelagic waters**

- Acknowledging effects of very shallow water and narrow channels on ship manoeuvring and handling
- Acknowledging effects of different hydrodynamic forces and moments on ship manoeuvring and handling
- Preparing and executing a passage plan and route in archipelagic waters
- Complying with the ColRegs, especially regarding narrow channels
- Conducting navigation and controlling the ship in archipelagic waters
- Monitoring the passage and maintaining planned speed in archipelagic waters
- Using different automatic and manual steering techniques
- Using different visual, terrestrial and radar navigation techniques
- Using blind pilotage and different parallel indexing techniques
- Detecting and correcting effects of wind and/or current on ship handling
- Planning and executing different controlled ship stopping techniques

- Completing tasks for preparing and executing a passage plan in archipelagic waters

## **15. Navigation in archipelagic and restricted fairways**

### **15.1. Navigation in archipelagic and restricted fairways during darkness**

- Acknowledging importance of navigation lights and light signalling equipment
- Preparing and executing a passage plan and route in archipelagic and restricted fairways
- Complying with the ColRegs, especially regarding narrow channels, lights and light signals
- Conducting navigation and controlling the ship in archipelagic and restricted fairways
- Monitoring the passage and maintaining planned speed in archipelagic and restricted fairways
- Using different visual, terrestrial and radar navigation techniques
- Using blind pilotage and different parallel indexing techniques
- Identifying and analysing traffic conditions
- Using different radar target acquisition techniques
- Using automatic radar plotting aids
- Identifying and analysing critical echoes
- Recognizing lights and light signals of navigational aids and other vessels
- Recognizing and analysing head-on or crossing situations
- Applying the ColRegs in head-on or crossing situations
- Applying the ColRegs in responsibilities between vessels
- Determining risk of collision
- Executing actions by give-way vessel or stand-on vessel
- Executing actions to avoid a close encounter or collision
- Completing tasks for navigating in archipelagic and restricted fairways during darkness

### **15.2. Navigation in archipelagic and restricted fairways in restricted visibility**

- Acknowledging importance of proper look-out and safe speed
- Acknowledging importance of sound signalling equipment
- Preparing and executing a passage plan and route in archipelagic and restricted fairways
- Complying with the ColRegs, especially regarding narrow channels, restricted visibility and sound signals
- Conducting navigation and controlling the ship in archipelagic and restricted fairways
- Monitoring the passage and maintaining planned speed in archipelagic and restricted fairways
- Using different radar navigation techniques
- Using blind pilotage and different parallel indexing techniques
- Identifying and analysing traffic conditions
- Using different radar target acquisition techniques
- Using automatic radar plotting aids
- Identifying and analysing critical echoes
- Recognizing sound signals of other vessels
- Recognizing and analysing head-on or crossing situations
- Applying the ColRegs in head-on or crossing situations
- Applying the ColRegs in responsibilities between vessels

- Determining risk of collision
- Executing actions by give-way vessel or stand-on vessel
- Executing actions to avoid a close encounter or collision
- Filling checklist for restricted visibility
- Completing tasks for navigating in archipelagic and restricted fairways in restricted visibility

## **16. Respond to emergencies and distress signals**

### **16.1. Initial emergency response**

- Acknowledging obligations to provide assistance
- Acknowledging importance of different emergency and distress signalling equipment
- Recognizing an emergency or distress signal of another vessel
- Identifying and analysing the emergency situation
- Responding to the emergency situation
- Executing initial emergency actions and manoeuvring of the ship
- Calling the master and alerting the crew
- Familiarizing with executing initial emergency and distress radio communications
- Filling checklists for emergencies
- Completing tasks for conducting initial emergency response

### **16.2. Search and rescue**

- Acknowledging contents of the IAMSAR Manual
- Acknowledging principles for effective emergency management
- Receiving notification of a person overboard
- Identifying and analysing the emergency situation
- Responding to the emergency situation
- Executing initial emergency actions and manoeuvring of the ship
- Calling the master and alerting the crew
- Familiarizing with implementing contingency plans and emergency instructions
- Familiarizing with navigating the ship in emergency situation
- Familiarizing with executing emergency and distress radio communications
- Familiarizing with co-operating with search and rescue services and other vessels
- Filling checklists for emergencies
- Recording bridge activities
- Completing tasks for conducting search and rescue

## **3.4.4 SIMULATOR TRAINING AT THE MANAGEMENT LEVEL 1**

Course outline for simulator training days 17–23 is described in below Table 5. This is mainly intended to be used by the instructors for planning and executing the training.

Table 5. Course outline

COURSE INFORMATION
<b>Level of training:</b> STCW Table A-II/1 Function: Navigation at the operational level and STCW Table A-II/2 Function: Navigation at the management level
<b>Course name:</b> Simulator training at the management level 1
<b>Course objective:</b> Knowledge, understanding of, and proficiency in <ul style="list-style-type: none"> <li>learning practical skills and completing approved simulator training based on prior STCW Table A-II/1 and A-II/2 studies</li> </ul>
<b>Recommended number of simulator training days: 7</b>
<b>Recommended duration for a single simulator training day: 8 hours including lunch and breaks</b>
TRAINING DAY INFORMATION
<b>17. Plan passages and conduct navigation</b> <p>17.1. Passage planning</p> <ul style="list-style-type: none"> <li>Creating a passage plan and route</li> <li>Creating and checking the route in ECDIS</li> <li>Identifying navigational hazards</li> <li>Planning and applying constant-ROT techniques</li> </ul> <p>17.2. Navigating and handling ship</p> <ul style="list-style-type: none"> <li>Executing and monitoring the passage plan</li> <li>Position determination by terrestrial observations and using navigational aids</li> <li>Navigating and handling ship in restricted waters</li> <li>Navigating and handling ship in restricted visibility</li> </ul> <b>18. Intermediate ship manoeuvring and handling in restricted and shallow waters</b> <p>18.1. Manoeuvring and handling ship in restricted waters</p> <ul style="list-style-type: none"> <li>Manoeuvring ship in a small area using a simulator course bounded by buoys</li> <li>Defining and applying turning, stopping and propulsion characteristics of single propeller ships</li> <li>Defining and applying turning, stopping and propulsion characteristics of a ship with transverse bow/aft steering thrusters</li> <li>Defining and applying turning, stopping and propulsion characteristics of dual propeller ships</li> </ul> <p>18.2. Manoeuvring and handling ship under the effects of wind and current</p> <ul style="list-style-type: none"> <li>Same exercises (18.1) with added effects of wind and current</li> </ul> <b>19. Ship manoeuvring and anchoring in VTS areas</b> <p>19.1. Anchoring the ship in a VTS area</p> <ul style="list-style-type: none"> <li>Planning the anchoring</li> <li>Determining the specific anchoring factors (number of anchors, cable length etc.)</li> <li>Participating in VTS reporting procedures</li> </ul>

#### 19.2. Navigating in restricted waterway in a VTS area

- Planning, creating and checking route in ECDIS
- Navigating, handling and manoeuvring ship at reduced speeds
- Participating in VTS reporting procedures
- Participating in radio communication with other traffic

### 20. Ship manoeuvring and hydrodynamic interaction effects

#### 20.1. Interactions between passing ships in fairway

- Navigating and manoeuvring in head-on situations
- Navigating and manoeuvring in overtaking situations

#### 20.2. Interactions between ship's hull and shallow waters

- Analysing the reduction in UKC on different types of ships caused by squat
- Manoeuvring and speed control in shallow water and the squat effect
- Manoeuvring and speed control in a narrow waterway and bank-cushion
- Manoeuvring and speed control in a narrow waterway and bank-suction

### 21. Arrival to and departure from port

#### 21.1. Planning the approach and berthing to a high-traffic port

- Planning the approach route from pilot position to berth in ECDIS
- Applying ColRegs
- Establishing and applying watchkeeping principles
- Navigating, applying position determination and the use of navigational aids

#### 21.2. Planning the unberthing and pilot-passage from a high traffic port in darkness

- Planning the route from berth to pilot position in ECDIS
- Applying ColRegs
- Establishing and applying watchkeeping principles, especially lookout
- Navigating, applying position determination and the use of navigational aids, especially radar

### 22. Ship berthing, manoeuvring and handling in challenging conditions

#### 22.1. Berthing and unberthing ships with different types of characteristics

- Applying correct approaching speeds, understanding the pivot-point and kick ahead
- Berthing and unberthing ship with single propeller moving both ahead and astern
- Berthing and unberthing ship with dual propeller moving both ahead and astern
- Use of thrusters (and azimuth propulsion if applicable) in berthing and unberthing

#### 22.2. Manoeuvring, handling and shifting berth under the effect of wind, current and restricted visibility

- Same exercise (22.1.) with added effects of moderate side-wind and current

### 23. Competence test (first mates' level)

#### 23.1. Plan and conduct a passage, shifting the ship's berth within harbour

- Completing tasks for evaluating and assessing students' or trainee's progress and competence in previously practised subject areas during simulator training days 17–22



### 3.4.5 SIMULATOR TRAINING AT THE MANAGEMENT LEVEL 2

Course outline for simulator training days 24–30 is described in below Table 6. This is mainly intended to be used by the instructors for planning and executing the training.

Table 6. Course outline

COURSE INFORMATION
<b>Level of training:</b> STCW Table A-II/2 Function: Navigation at the management level
<b>Course name:</b> Simulator training at the management level 2
<b>Course objective:</b> Knowledge, understanding of, and proficiency in <ul style="list-style-type: none"> <li>learning practical skills and completing approved simulator training based on prior STCW Table A-II/2 studies</li> </ul>
<b>Recommended number of simulator training days:</b> 7
<b>Recommended duration for a single simulator training day:</b> 8 hours including lunch and breaks
TRAINING DAY INFORMATION
<b>24. Plan voyages and conduct navigation</b> <ul style="list-style-type: none"> <li>24.1. Passage planning               <ul style="list-style-type: none"> <li>Creating a passage plan and route</li> <li>Creating and checking a route in ECDIS</li> <li>Analysing navigational hazards and conditions</li> </ul> </li> <li>24.2. Navigating and handling ship               <ul style="list-style-type: none"> <li>Executing and monitoring the passage plan</li> <li>Position determination by terrestrial observations and using navigational aids</li> <li>Navigating and handling ship in restricted waters and inland waterways</li> <li>Navigating and handling ship in restricted visibility</li> </ul> </li> </ul>
<b>25. Pilot boarding, MRM and leadership skills</b> <ul style="list-style-type: none"> <li>25.1. Pilot embarking and disembarking               <ul style="list-style-type: none"> <li>Planning the operations approaching pilot position</li> <li>Manoeuvring and handling the ship during pilot transfer</li> <li>Analysing and applying correct procedures regarding conditions, traffic and navigational hazards</li> </ul> </li> <li>25.2. Navigating the ship under pilotage and resource management               <ul style="list-style-type: none"> <li>Navigating and handling the ship as a bridge team with pilot onboard</li> <li>Understanding the bridge team roles and responsibilities</li> <li>Observing and applying MRM principles</li> </ul> </li> </ul>
<b>26. Advanced ship handling, berthing and unberthing</b> <ul style="list-style-type: none"> <li>26.1. Berthing and unberthing ship in a congested port               <ul style="list-style-type: none"> <li>Applying correct manoeuvres and approach speed</li> </ul> </li> </ul>



- Handling ship into low clearance berthing position between other ships
- Berthing and unberthing ship with single and dual propeller without tug assistance
- Ability to perform tasks under moderate to heavy wind conditions

26.2. Approaching berth with a large ship having large stopping distance

- Analysing and planning the approach, stopping distance and position
- Applying speed reduction manoeuvres (e.g. rudder cycling)
- Applying accurate head reach to stop the ship in to correct position

**27. Ship and tug interaction and towing operations**

27.1. Basic ship and tug interaction

- Applying correct manoeuvres in ship and tugs connected to bow and aft
- Turning the ship at its position with the assistance of tugs
- Applying correct communication procedures

27.2. Berthing ship with tug assistance

- Applying correct escort towing procedures both in ship and tugs
- Turning and controlling the speed and position of the ship with tugs
- Applying correct communication procedures
- Ability to perform berthing under tug assistance

**28. Respond to navigational emergencies and faults**

28.1. Position data fault

- Navigating and handling ship without position data from navigational aids (e.g. GPS)
- Applying correct methods for alternative position determination

28.2. Course data fault

- Navigating and handling ship without course data (e.g. Gyro)
- Applying correct methods for acquiring alternative course data
- Ability to determine errors for magnetic and gyro compass

28.3. Ship not under command and drifting

- Applying correct procedure in loss-of-control of ship
- Applying correct radio communication procedures
- Analysing drifting characteristics

**29. Search and rescue operations**

29.1. Single ship search and rescue

- Applying IAMSAR Manual
- Planning and conducting search and rescue as a single vessel in open sea

29.2. Multiple ships search and rescue

- Applying IAMSAR Manual
- Planning and conducting search and rescue in cooperation with other ships in open sea and near the coast
- Applying correct radio communication procedures
- Ability to perform as on-scene commander

**30. Competence test (masters' level)**

30.1. Plan and conduct a passage, berthing ship with dual propellers under rough conditions

- Completing tasks for evaluating and assessing students' or trainee's progress and competence in previously practised subject areas during simulator training days 24–29

## REFERENCES

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