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Antwerp Maritime Academy

Study guide

Master in Marine Engineering

Academic year 2025-2026

Master in Marine Engineering

Mandatory subjects	Th/Pr	UC
Faculty of Marine Engineering		
MECHATRONICS	**24/24**	**4**
Mechatronics	24/24	4
MARINE ENGINEER SKILLS TRAINING - PART 4, SEMINARS - PART 2 AND MULTIDISCIPLINARY SIMULATOR EXERCISES - PART 3	**-/48**	**4**
Marine engineer skills training - part 4 and seminaries - part 2	-/24	2
Multidisciplinary simulator exercises - part 3	-/24	2
OPTIMIZATION AND INNOVATION OF ENERGY SYSTEMS	**24/-**	**3**
Optimization and innovation of energy systems	24/-	3
DREDGING & OFFSHORE TECHNOLOGIES	**24/-**	**3**
Dredging and offshore technologies	24/-	3
MANAGEMENT OF INNOVATION IN MARINE ENGINEERING	**24/-**	**3**
Management of innovation in marine engineering	24/-	3
ADVANCED CONTROL TECHNOLOGIES	**24/24**	**4**
Advanced control technologies	24/24	4
Faculty of Sciences		
MASTER THESIS	**-/-**	**15**
Master thesis	-/-	15
THE HUMAN ELEMENT IN A MARITIME ENVIRONMENT	**8/16**	**3**
The human element in a maritime environment	8/16	3
CLASSIFICATION AND SURVEY	**24/-**	**3**
Classification and survey	24/-	3
INFORMATION AND COMMUNICATION TECHNOLOGY	**24/-**	**3**
Information and communication technology	24/-	3

Elective subjects

Faculty of Marine Engineering

Nautical Faculty

ADVANCED TANKER TRAINING GAS AND IGF	**18/18**	**3**
Advanced tanker training gas & IGF	18/18	3
ADVANCED TANKER TRAINING CHEMICALS	**18/18**	**3**
Advanced tanker training chemicals	18/18	3
ADVANCED TANKER TRAINING OIL	**18/18**	**3**
Advanced tanker training oil	18/18	3
ADVANCED MARITIME ECOLOGY AND TECHNOLOGY	**24/12**	**3**
Advanced maritime ecology and technology	24/12	3

Faculty of Sciences

DATA ANALYTICS AND AI FOR THE MARITIME INDUSTRY	**24/-**	**3**
Data analytics and AI for the maritime industry	24/-	3
DATA ANALYTICS AND AI FOR THE MARITIME INDUSTRY	**-/-**	**3**
ANALYSIS OF SHIPPING MARKETS	**24/-**	**3**
Analysis of shipping markets	24/-	3
PORT MANAGEMENT AND POLICY	**24/-**	**3**
Port management and policy	24/-	3

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**MECHATRONICS (4 UC)**
Course element	**Mechatronics (HZS-SW-SWM401)**
Lecturer(s)	**Pascal BOUQUET**
Lecturer in charge	Pascal BOUQUET
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	
Instruction language	Dutch/French
Required preliminary credit(s)	
Units of credit (UC)	4
Hours of formal lecture/ practical exercise	24/24
Semester + module(s)	**Semester 1, Module 1.1 12/12** | **Semester 1, Module 1.2 12/12** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - analyze complex "intelligent" mechatronic systems, composed of mechanical and electrical engineering, measurement and control technology and computer science, with a view to their maintenance, durability and control, as well as identify their limits, including: -make a motivated choice among the constituent components of the mechatronic system, - microcontroller - microprocessor, -sensors and actuators and/or -communication protocol systems to solve a specific problem; -and visualization and/or monitoring; -determine and calculate the properties of measuring sensors and actuators: e.g. sensitivity, nonlinear deviation and precision; -determine, based on the original manuals, whether a particular component can be used in a particular application; -connect and program the different components in the assembly; -to develop testing and validation methods for the various components, including calibration and a test report for the entire system; -to understand in its entirety the design and implementation of complex systems (intelligent, connected , etc.), -to identify and master the constraints of the integration of these systems combining mechanics, electronics, automation and IT, -to design and develop testing and validation methods of the whole system.

<table>
<tr><td>Course content</td><td>Mechatronics is the technical discipline that combines mechanical engineering, electrical engineering and measurement and control technology (automation and electronics) into an "intelligent" system.

The student is invited to complete independently a project using the total technical knowledge he/she has acquired in his/her bachelor's degree program as to use

1. the results of the kinematic or dynamic simulation of the behavior of a interpret a complex mechanical system with a view to the sustainability of the entire mechatronic construction and its control system, including the dimensioning of actuators and/or sensors.
2. To guarantee the interface between the various components in the system, the student familiarizes with digital communication and bus systems on board a ship. He/she analyzes and comments on the different protocols and bus systems on board a ship (RS232, RS422, NMEA0183, NMEA2000, CAN bus, etc.).
3. Design the HMI, human-machine interface, to ensure monitoring of the mechatronic system.

The following themes can be discussed:
- configuration and programming of a vision system
- processing of analog signals
- displaying results on an HMI, reporting via email, communication with the cloud (IoT)
- specific themes can be discussed depending on their relevance at that time .
e.g.
- active dredging head;
- processing of vibration measurements for predictive maintenance;

- analysis of the exhaust emissions; ... .</td></tr>
<tr><td>Learning outcomes</td><td>- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a)
- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/6, A-V and A-VI for Electro-Technical Officers (ETO) on seagoing vessels (mastSW-b)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d)
- Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e)
- Have advanced understanding of digital system controls and data processing (mastSW-g)
- Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h)
- Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)</td></tr>
<tr><td>Examination</td><td><table><tr><td>Following Module 1.1
permanent evaluation</td><td>Following Module 1.2
oral exam with written preparation and permanent evaluation</td><td>Following Module 2.1
-</td><td>Following Module 2.2
-</td></tr><tr><td colspan="4">Second session
oral exam with written preparation en integrated practical test</td></tr></table></td></tr>
<tr><td>Caesura measures</td><td></td></tr>
<tr><td>Required study material</td><td>- Lecturer's course text available.
- Safety clothing.
- Arduino Uno (microcontroller) starter set
- Breadboard
- Only scientific calculator allowed.</td></tr>
<tr><td>Recommended preliminary competences</td><td>Marine engineering skills training - part 1
Pneumatics
Ship's electrotechnics - part 3
Ship electronics and ITC - part 2
Information and communication technology
Advanced control technologies</td></tr>
<tr><td>Additional information</td><td>- MECHATRONICS: Electronic control systems in mechanical and electrical engineering (7th Ed.); William Bolton, Pearson; ISBN 978-292-25097-7 (print); 978-292-25100-4 (pdf); 978-292-25099-1 (ePub).</td></tr>
</table>

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**MARINE ENGINEER SKILLS TRAINING - PART 4, SEMINARS - PART 2 AND MULTIDISCIPLINARY SIMULATOR EXERCISES - PART 3 (4 UC)**
Course element	**Marine engineer skills training - part 4 and seminaries - part 2 (HZS-SW-SWM421)**
Lecturer(s)	**Stefaan BUEKEN, Bart GABRIËL**
Lecturer in charge	Stefaan BUEKEN, Bart GABRIËL
Educational programme	**Master in Marine Engineering**

Method of teaching	Practical exercises
Other teaching methods	Excursion Group work Demonstration
Instruction language	Dutch/French + English
Required preliminary credit(s)	**Strict succession (must have followed and passed)** Marine engineer skills training - part 3, seminars - part 1 and multidisciplinary simulator exercises - part 2
Units of credit (UC)	2
Hours of formal lecture/ practical exercise	-/24
Semester + module(s)	**Semester 1, Module 1.1 -/12** | **Semester 1, Module 1.2 -/12** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - perform maintenance and repairs on main and auxiliary equipment; - schedule maintenance; - work independently and safely; - demonstrate leadership; - work safely and adapt the workplace and work attitude of the individual and group accordingly; - report maintenance; - carry out measurements and tests on main and auxiliary tools to determine tool condition; - act correctly and quickly in a crisis situation through the experience gained in this simulated environment; - learn from his own and others' mistakes; - communicate clearly with his team and the rest of the crew on board; - compare the different forms of maintenance plans.
Course content	In this course, the student performs repairs and maintenance on main and auxiliary equipment in the workshop. He/she measures and conducts tests on main and auxiliary equipment to determine their condition. The student manages workshop safety, plans maintenance and tasks, and reports on these activities. He/she works independently and solution-oriented, demonstrating leadership skills. The student investigates when maintenance is necessary and studies the various types of maintenance plans.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/6, A-V and A-VI for Electro-Technical Officers (ETO) on seagoing vessels (mastSW-b) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - As responsible engineer officer, lead and competently communicate with an international multiculrural team (mastSW-j) - Bear responsibility as an expert in safety and sustainability (mastSW-k)

Examination	**Following Module 1.1 permanent evaluation**	**Following Module 1.2 oral exam and permanent evaluation**	Following Module 2.1 -	Following Module 2.2 -
	Second session practical test			
Caesura measures	- 100% presence in practical sessions mandatory to be evaluated in the first exam session; - 100% presence in practical sessions mandatory to be evaluated in the first and second exam session.			
Required study material	- Lecturer's course text available. - Scientific and graphic calculators allowed.			
Recommended preliminary competences				
Additional information				

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**MARINE ENGINEER SKILLS TRAINING - PART 4, SEMINARS - PART 2 AND MULTIDISCIPLINARY SIMULATOR EXERCISES - PART 3 (4 UC)**
Course element	**Multidisciplinary simulator exercises - part 3 (HZS-SW-SWM422)**
Lecturer(s)	**Bart GABRIËL**
Lecturer in charge	Stefaan BUEKEN, Bart GABRIËL
Educational programme	**Master in Marine Engineering**

Method of teaching	Practical exercises
Other teaching methods	
Instruction language	Dutch/French
Required preliminary credit(s)	**Strict succession (must have followed and passed)** Marine engineer skills training - part 3, seminars - part 1 and multidisciplinary simulator exercises - part 2
Units of credit (UC)	2
Hours of formal lecture/ practical exercise	-/24
Semester + module(s)	**Semester 1, Module 1.1 -/12** | **Semester 1, Module 1.2 -/12** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - act correctly and quickly in a crisis situation through the experience gained in this simulated environment; - learn from his/her own and others' mistakes; - communicate clearly with his team and the rest of the crew on board; - report technical accidents on board, assessing their consequences, correctly representing them and presenting possible solutions; - establish, from the experience gained, procedures to avoid technical accidents in the future; - establish procedures from experience to correctly respond to identical emergency situations in the future; - develop leadership.
Course content	In this course, the student responds in a correct and safe manner to crisis situations in a simulated environment and as part of a team. The scenarios in the exercises that the student completes are based on real-life situations and simulate reality. If he/she does not act correctly in these simulations, the safety of the simulated ship and crew is jeopardized. The student also develops leadership skills in a simulated environment.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/6, A-V and A-VI for Electro-Technical Officers (ETO) on seagoing vessels (mastSW-b) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h)
Examination	**Following Module 1.1 permanent evaluation** | **Following Module 1.2 permanent evaluation with integrated practical test** | Following Module 2.1 - | Following Module 2.2 - **Second session practical test**
Caesura measures	- 100% presence in practical sessions mandatory to be evaluated in the first and second exam session.
Required study material	- No calculator allowed.

Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**OPTIMIZATION AND INNOVATION OF ENERGY SYSTEMS (3 UC)**
Course element	**Optimization and innovation of energy systems (HZS-SW-SWM431)**
Lecturer(s)	**Gijs VANDEN BOGAERDE**
Lecturer in charge	Gijs VANDEN BOGAERDE
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	Dutch/French
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	**Semester 1, Module 1.1 12/-** | **Semester 1, Module 1.2 12/-** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - map and analyze energy systems and flows; - propose solutions to optimize energy systems; - perform an analysis after modifications to an energy system and report on the advantages and disadvantages under different conditions; - determine the impact of the use of alternative energy sources on the overall energy balance of the installation and report on it.
Course content	The energy systems on board ships and offshore installations operate in island mode and are 100% controlled by the crew. In this course, the student learns how energy flows can be managed and optimized. The student delves deeper into energy recovery, energy storage, and the use of alternative energy sources, as well as the combination of conventional and alternative energy sources. Additionally, he/she investigates the impact of using and storing alternative fuels on the overall energy system.
Learning outcomes	- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	**Following Module 1.1 oral exam with written preparation** | **Following Module 1.2 oral exam with written preparation** | Following Module 2.1 - | Following Module 2.2 - **Second session oral exam with written preparation**
Caesura measures	
Required study material	- No calculator allowed.
Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**DREDGING & OFFSHORE TECHNOLOGIES (3 UC)**
Course element	**Dredging and offshore technologies (HZS-SW-SWM441)**
Lecturer(s)	**Bart GABRIEL**
Lecturer in charge	Bart GABRIËL
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	**Semester 1, Module 1.1 12/-** | **Semester 1, Module 1.2 12/-** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - compare the technical differences of ships; - assess engine room arrangements for redundancy; - compare different processes; - assess offshore operations; - compare shipboard functions; - produce an FMEA of a ship.
Course content	During this course, the student delves into the various operations and processes encountered in the offshore industry. The focus is on the different types of ships and the variation in engine room design. He/she studies the risks and the resulting technical solutions. Furthermore, the division of tasks among the crew is addressed, as this is somewhat different from that in the merchant navy. The student evaluates the technical installation of a ship in a structured manner, develops a fault and effect analysis, and devises improvements and expansions.
Learning outcomes	- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e) - Have an advanced understanding of inspection and survey of ocean-going vessels and maritime installations (mastSW-f) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	Following Module 1.1 - | **Following Module 1.2 oral exam with written preparation** | Following Module 2.1 - | Following Module 2.2 - **Second session oral exam with written preparation**
Caesura measures	
Required study material	- Scientific and graphic calculators allowed.
Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**MANAGEMENT OF INNOVATION IN MARINE ENGINEERING (3 UC)**
Course element	**Management of innovation in marine engineering (HZS-SW-SWM451)**
Lecturer(s)	**Bart GABRIEL, Geert POTTERS**
Lecturer in charge	Geert POTTERS
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	Group work
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	**Semester 1, Module 1.1** **12/-** | **Semester 1, Module 1.2** **12/-** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - analyse and integrate innovative technological developments in shipping in a scientifically sound manner; - reflect on the design cycle when implementing innovative technologies and propose adequate solutions based on their own reflection; - work in a structured way on a project basis; - give a short and effective pitch around an industrially relevant innovation.
Course content	After an introduction to project-based work and an expansion of the content of "Innovative and Sustainable Maritime Technologies" (3Ba), the student develops a concrete case in which relevant innovative technologies must solve a problem on board. The student collects information through seminars with experts from the field, through company visits and own research. He develops his own scientifically supported vision of possible solutions and writes a structured and substantiated project plan. This is ultimately pitched to fellow students and teachers.
Learning outcomes	- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - Independently set up and carry out a scientific maritime research project at the level of a beginner researcher; select and correctly apply relevant research methods and techniques; critically process and scientifically report the results of this research (mastSW-i) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	Following Module 1.1 - | **Following Module 1.2** **integrated practical test** | Following Module 2.1 - | Following Module 2.2 - **Second session** **practical test**
Caesura measures	
Required study material	- Lecturer's course text available. - No calculator allowed.

Recommended preliminary competences	Innovative and sustainable maritime technologies
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**ADVANCED CONTROL TECHNOLOGIES (4 UC)**
Course element	**Advanced control technologies (HZS-SW-SWM461)**
Lecturer(s)	**Raf MAES**
Lecturer in charge	Raf MAES
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	
Instruction language	Dutch/French
Required preliminary credit(s)	**Standard succession (must have followed)** Ship automation - part 2
Units of credit (UC)	4
Hours of formal lecture/ practical exercise	24/24
Semester + module(s)	**Semester 1, Module 1.1 12/12** | **Semester 1, Module 1.2 12/12** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - analyze program code and understand and predict the operation of an existing program; - to have insight into the operation of programs based on the analysis of program code; - predict the operation of a program based on analysis of the program code; - to come up with creative solutions to these problems; - independently look up relevant information.
Course content	In the theoretical part of this course, the student learns the theory of advanced automation methods and learns to work with IoT by using C, Python or Scilab. Topics covered include: - observability and verifiability by means of state space approach; - stochastic control and the Kalman filter; - nonlinear dynamics; - signals and systems where the theory of signal filters is also touched upon in the context of IoT; - condition-based maintenance; - IoT with condition-based maintenance as an application. In the practical part of the course, the student will convert an IoT problem into an algorithm and convert that algorithm into code. The code is programmed on Arduino in C and on Raspberry Pi in Python. The student describes the core of the assignment, maps the requirements and converts his assignment into an algorithm. He/she checks whether the solution meets the requirements of the assignment. The student will extensively document both the way he arrived at a solution and the code he/she wrote.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/6, A-V and A-VI for Electro-Technical Officers (ETO) on seagoing vessels (mastSW-b) - Have advanced understanding of digital system controls and data processing (mastSW-g) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)

Examination	**Following Module 1.1 integrated practical test**	**Following Module 1.2 oral exam with written preparation en integrated practical test**	Following Module 2.1 -	Following Module 2.2 -
	Second session oral exam with written preparation en practical test			
Caesura measures	- 100% presence in practical sessions mandatory to be evaluated in the first and second exam session.			
Required study material	- Lecturer's course text available. - No calculator allowed.			
Recommended preliminary competences				
Additional information				

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**MASTER THESIS (15 UC)**
Course element	**Master thesis (HZS-SW-SWM490)**
Lecturer(s)	**Promotor**
Lecturer in charge	Faculteitscoördinatoren
Educational programme	**Master in Marine Engineering**

Other teaching methods	
Instruction language	Dutch/French
Required preliminary credit(s)	**Standard succession (must have followed)** Bachelor term paper and scientific research methods
Units of credit (UC)	15
Hours of formal lecture/ practical exercise	-/-
Semester + module(s)	Semester 1, Module 1.1 -/- | Semester 1, Module 1.2 -/- | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - critically evaluate scientific sources for accuracy and relevance; - independently design and conduct maritime scientific research at the level of a novice researcher; - develop a problem-solving strategy based on theoretical arguments, calculations, and experiments, and execute it by selecting and correctly applying the relevant research methods and techniques; - clearly document and justify the scientific research methodology used; - critically reflect on the collected information, the conducted research, and the obtained results, and justify the choices made; - clearly and concisely present the conducted research, defend it, and answer questions about the research project.
Course content	The student caps off their education by developing their own research project on a self-chosen topic in marine engineering, and reporting on it. This topic is related to the education and/or professional field. The master's thesis generally consists of a further deepening of the bachelor's thesis, allowing the student to build on the preparation from the bachelor's thesis. In doing so, the student combines skills developed throughout the entire course of study.
Learning outcomes	- Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - Independently set up and carry out a scientific maritime research project at the level of a beginner researcher; select and correctly apply relevant research methods and techniques; critically process and scientifically report the results of this research (mastSW-i) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	**Following Module 1.1 oral exam** | **Following Module 1.2 oral exam** | **Following Module 2.1 oral exam** | **Following Module 2.2 oral exam** **Second session oral exam**
Caesura measures	
Required study material	- No calculator allowed.
Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**THE HUMAN ELEMENT IN A MARITIME ENVIRONMENT (3 UC)**
Course element	**The human element in a maritime environment (HZS-WE-HT-SWM411)**
Lecturer(s)	**Camille DEBANDT, Sophie LIMBOS, Kathy SPEELMAN**
Lecturer in charge	Sophie LIMBOS
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	Portfolio Group work
Instruction language	Dutch/French
Required preliminary credit(s)	**Standard succession (must have followed)** General and intercultural communication and MCRM
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	8/16
Semester + module(s)	**Semester 1, Module 1.1 4/8** | **Semester 1, Module 1.2 4/8** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - to master the principles of situational leadership and apply them to a (multicultural) team; - critically reflect on the function of a leading officier on board; - activate resources in order to promote wellbeing; - critically reflect on communicative situations and actions in order to anticipate and, if possible, avoid communicative misunderstandings; - use techniques to adjust non desirable or non functional behaviour of team members.
Course content	The master student in Marine Engineering is made aware of the complexity of his/her position as a (social) leader on board and is offered the knowledge and competences to perform this role optimally. In order to accomplish these course objectives, the collaboration with the maritime industry is put forward. The master student in Marine Engineering gets a deeper insight into the psychosocial aspects specific to working and living on board and which have an impact on the performance of an officer of the watch. Multiculturalism and hierarchy, team work and group dynamics, leadership and wellbeing are the major themes. In addition, communicative situations and types of communication the future officer will face, are also dealt with. The main goal of this course is to strengthen the soft skills needed to perform a responsible leadership.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - As responsible engineer officer, lead and competently communicate with an international multiculrural team (mastSW-j) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	**Following Module 1.1 permanent evaluation** | **Following Module 1.2 permanent evaluation** | Following Module 2.1 - | Following Module 2.2 - **Second session oral exam**
Caesura measures	- 100% presence in practical sessions mandatory to be evaluated in the first exam session.
Required study material	- Lecturer's course text available. - No calculator allowed.

Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**CLASSIFICATION AND SURVEY (3 UC)**
Course element	**Classification and survey (HZS-NW-EXP-SWM401)**
Lecturer(s)	**Bart GABRIEL, Bart HEYLBROEK**
Lecturer in charge	Bart GABRIËL
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	**Semester 1, Module 1.1** **12/-** | **Semester 1, Module 1.2** **12/-** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - be able to identify critical locations of a ship's structure; - know, understand and link applicable international objectives and standards regarding ship structure and inspection; - recognize types of damage to a ship's structure, understand their origin and propose possible solutions to repair them; - Know the damage reduction options for ice-strengthened ships; - take preventive and damage control actions in the context of corrosion, overloading of the ship's structure and in general; - assess survey intervals; - evaluate the impact on the continuity of the vessel's operation; - organise a survey programme; - distinguish and interpret the different types of surveys.
Course content	The student undergoes familiarization with the technical aspects of a ship, which are directly related to maintenance and damage inspections, including the identification of critical place in the ship's structure. In the first part (inspection, survey and maintenance) a distinction is made between failure and damage, after which the different types of inspections are discussed. Different levels of failure and damage are discussed and various causes are illustrated, including crack formation with the identification of regions of increased stresses and weakening of structures. Corrosion as a source of damage is also examined as well as the protection of a ship's hull against corrosion. This is followed by a discussion of measures to prevent damage. In the second part (inspection and survey of machinery items) the student learns the principles of inspections and surveys applied to the technical of the ship. In this section we look in a practical way at what is inspected when and how and what impact this has on the productivity of the ship. We look at the different survey options with their advantages and disadvantages in relation to the employability of the ship.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Have an advanced understanding of inspection and survey of ocean-going vessels and maritime installations (mastSW-f)
Examination	Following Module 1.1 - | **Following Module 1.2** **written exam** | Following Module 2.1 - | Following Module 2.2 - **Second session** **written exam**

Caesura measures	
Required study material	- Lecturer's course text available. - No calculator allowed.
Recommended preliminary competences	
Additional information	- AMACORT. (2014). A field study of the effectiveness of sacrificial anodes in ballast tanks of merchant ships. *Journal of Marine Science and Technology.* DOI: 10.1007/s00773-013-0232-3. - AMACORT. (2017). The Economics of a Long Term Coating. *International Journal of Maritime Engineering (IJME)*, Transactions RINA, Vol 159, Part A3. DOI No: 10.3940/rina.ijme.2017.a3.416. - Contraros, P.D. (2003). *The Domino Effect" Coating Breakdown - Corrosion - Structural Failures Leading to Possible Design Ramifications*. MRINA ABS Europe. - European Union. (2009). *Regulation (EU) No 1257/2013 of the European parliament and of the council of 20 November 2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC, as amended.* Brussels, Belgium: European Parliament and Council. - International Association of Classification Societies. (1997). *BULK CARRIERS - Guidance and Information on Bulk Cargo Loading and Discharging to Reduce the Likelihood of Over-stressing the Hull Structure.* London, UK: IACS. - International Association of Classification Societies. (2002). *BULK CARRIERS - guidelines for Surveys, Assessment and Repair of Hull Structures*. London, UK: Witherby & Co. ISBN: 1856092232. - International Association of Classification Societies. (2005). *Guidelines for coating maintenance and repairs*. London, UK: Witherby & Co. ISBN: 1856093085. - International Association of Classification Societies. (2011). *Classification Societies - What, Why and How?.* London, UK: IACS. - International Association of Classification Societies. (2016). *IACS Objectives, Strategy and Action Plan (2016-2017)*. London, UK: IACS. - International Association of Classification Societies. (Rev. 2 May 2015). *Recommendation 87, Guidelines for coating maintenance & repairs for ballast tanks and combined cargo/ballast tanks on oil tankers*. London, UK: IACS. - International Labour Organization. (2004). *Safety and health in shipbreaking: Guidelines for Asian countries and Turkey*. Geneva, Switzerland: ILO. ISBN: 9221152898. - International Maritime Organization. (2006). *Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers RESOLUTION MSC.215(82), as amended.* London, UK: IMO. - International Maritime Organization. (2010). *International Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers (GBS Standards) (resolution MSC.287(87)).* London, UK: IMO. - International Maritime Organization. (as amended). *Polar Code (A.1024(26) Ships operating in polar waters).* London, UK: IMO. - Lloyd's Register. (2002). *A Master's Guide to Hatch Cover Maintenance.* London, UK: The Standard. ISBN: 1856092321. - Lloyd's Register. (2014). *ESP Guidance booklet for all ship types in preparation for a special survey.* London, UK: LR. - Melchers, R.E. (1999). Corrosion uncertainty modelling for steel structures. *Journal of Constructional Steel Research*, 52, 3-19. Amsterdam, The Netherlands: Elsevier. - Oil Companies International Marine Forum. (1997). *Factors influencing accelerated corrosion of cargo oil tanks.* London, UK: OCIMF. - Tanker Structure Co-operative Forum. (2010). *Guidelines for the inspection and maintenance of double hull tanker structures*. Edinburgh, UK: Witherby Seamanship International. ISBN: 9781856090803.

ECTS Information Package

Antwerp Maritime Academy

Programme	**Master in Marine Engineering**
Course	**INFORMATION AND COMMUNICATION TECHNOLOGY (3 UC)**
Course element	**Information and communication technology (HZS-SW-SWM411)**
Lecturer(s)	**Jonas JOOS**
Lecturer in charge	Deirdre LUYCKX
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	**Semester 1, Module 1.1** **12/-** | **Semester 1, Module 1.2** **12/-** | Semester 2, Module 2.1 -/- | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: -understand the performance of computer systems based on the architecture and hardware used (microprocessor, I/O devices, graphics cards, hard drives); -understand the role of semiconductor and magnetic materials in computer hardware; -build a working computer from individual components or replace parts of an existing computer; -deduce the functioning of small programs written in assembly language; -program the Linux operating system, master UNIX system calls, and transfer this knowledge to other operating systems; -understand the structure of the internet and the layering of computer networks; -build, configure, and maintain a local network, as well as analyze and solve problems in existing networks; -assess the issues and dangers associated with certain types of software, such as viruses, and propose techniques to protect against these threats.
Course content	The student will learn to interact with (modern) computer systems in a professional manner and gain a deep understanding of their operation. The first part expands upon knowledge of embedded systems and microcontrollers, so that the student explores the architecture and hardware of computer systems. In doing so, the student will focus on the materials basis of computers, such as semiconductor technology and magnetic materials used in data storage. The student studies the interconnections between the components of a computer system (hardware) within the context of system architecture. He/she explores various technologies in depth, with a comparative analysis of their advantages and disadvantages. The second part covers computer networks and data communication, using the protocol stack hierarchy. Students will be introduced to the hardware required for building a network, network topologies, cabling, modems, and other communication devices, as well as higher-layer protocols. In particular, he/she focuses on the TCP/IP protocol that forms the backbone of Internet communication, as well as user-level protocols such as HTTP, FTP, and email. Finally, the student focuses on security at the computer, operating system, and network levels.
Learning outcomes	- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Have advanced understanding of digital system controls and data processing (mastSW-g)
Examination	Following Module 1.1 - | **Following Module 1.2** **oral and written exam** | Following Module 2.1 - | Following Module 2.2 - **Second session** **oral and written exam**
Caesura measures	
Required study material	- Lecturer's course text available. - Scientific and graphic calculators allowed.

Recommended preliminary competences	
Additional information	- Kurose, J. F. & Ross, K. W., *Computer Networking: A Top-Down Approach*, 6th edition, ISBN 978-0-13-285620-1 (2013). - Null, L. and Lobur, J., *The Essentials of Computer Organization and Architecture*, 5th edition, ISBN 978-1284123036 (2018). - Silberschatz, A., Galvin, P. B. & Gagne, G., *Operating System Concepts*, 10th edition, ISBN 978-1-119-32091-3 (2018). - Tanenbaum, A. S. & Austin, T., *Structured Computer Organization*, 6th edition, Pearson Education, ISBN 978-0-13-291652-3 (2013). - Tanenbaum, A. S. & Wetherall, D. J., *Computer Networks*, 5th edition, ISBN 978-0-13-212695-3 (2011)

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**ADVANCED TANKER TRAINING GAS AND IGF (3 UC)**
Course element	**Advanced tanker training gas & IGF (HZS-NW-EXP-SWM421)**
Lecturer(s)	**Werner JACOBS, Anne-Pascale MORNARD, Denis STEVENS**
Lecturer in charge	Werner Jacobs
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	**Strict succession (must have followed and passed)** Basic tanker training (oil, gas, chem and IGF)
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	18/18
Semester + module(s)	**Semester 1, Module 1.1 6/-** | **Semester 1, Module 1.2 12/-** | **Semester 2, Module 2.1 -/18** | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - recognise physical and chemical properties of liquid gas cargo/fuel on board ships subject to the IGF Code; - plan, conduct and follow up gas and fuel operations on board ships subject to the IGF Code in a safe manner; - take measures to prevent pollution of the environment by a release of gas/fuel on board ships subject to the IGF Code; - take measures to prevent hazards; - verify and follow up on agreement with the prevailing legislation.
Course content	The courses Advanced Tanker training Oil, Advanced Tanker training Gas and IGF, and Advanced Tanker training Chemicals are a continuation and deepening of the module Basic Tanker training for Oil, Chemicals, Gas and IGF. They start with a common theoretical part in which the student first elaborates on the study of cargo calculations on board oil, chemical and gas tankers within more advanced issues. In addition, the student gets acquainted with the phenomenon of hammering and studies the possibilities of static electricity on board liquid cargo ships. In the course Advanced Tanker training Gas and IGF, the physical and chemical properties of liquefied gas are further discussed. Also the possible health effects after contact with the cargo or cargo vapours are explained. In the second chapter the student learns in detail how liquefied gases can be transported on a seagoing vessel, with an emphasis on the different tank designs. The third chapter is a selection of the existing legislation, with the importance for the operator of gas tankers as a leitmotif. The different types of ships are considered as well as the requirements regarding ventilation. In the next chapter the student gets acquainted with the different instruments and equipment specific to a gas tanker or IGF vessel and how to use them. After acquiring this subject matter, the different operations are discussed in detail, both on board an LNG, LPG and IGF ship. Finally, the student learns more about emergency procedures and communication with the shore terminal. The labs take place on the gas simulator. The emphasis is on practising the various operations as discussed in the theory. The student gets the opportunity to carry out the different operations on the simulator of LNG, LPG as well as IGF vessels. The student performs 2 bunker operations on a simulator during the ship auxiliaries course.

<table>
<tr><td>Learning outcomes</td><td>- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d)
- Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e)
- Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h)</td></tr>
<tr><td>Examination</td><td><table><tr><td>Following Module 1.1
-</td><td>Following Module 1.2
-</td><td>Following Module 2.1
permanent evaluation</td><td>Following Module 2.2
oral exam with written preparation</td></tr><tr><td colspan="4">Second session
oral exam with written preparation</td></tr></table></td></tr>
<tr><td>Caesura measures</td><td>- 100% presence in practical sessions mandatory to be evaluated in the first exam session;
- Obtain a minimum of 10/20 for each part of the exam to pass for this element.</td></tr>
<tr><td>Required study material</td><td>- Lecturer's course text available.

- Only scientific calculator allowed.</td></tr>
<tr><td>Recommended preliminary competences</td><td></td></tr>
<tr><td>Additional information</td><td></td></tr>
</table>

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**ADVANCED TANKER TRAINING CHEMICALS (3 UC)**
Course element	**Advanced tanker training chemicals (HZS-NW-EXP-SWM431)**
Lecturer(s)	**Inez HOUBEN, Kathy SPEELMAN, Denis STEVENS**
Lecturer in charge	Kathy Speelman
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	Group work
Instruction language	English
Required preliminary credit(s)	**Strict succession (must have followed and passed)** Basic tanker training (oil, gas, chem and IGF)
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	18/18
Semester + module(s)	**Semester 1, Module 1.1 6/-** | Semester 1, Module 1.2 -/- | **Semester 2, Module 2.1 12/-** | **Semester 2, Module 2.2 -/18**
Learning objectives	At the end of the course, the student is expected to be able to: - recognise physical and chemical properties of hazardous liquid substances on board ships subject to the IBC Code; - select and apply correct, safe procedures in carrying out the various parts of cargo handling on chemical tankers in accordance with the IBC Code and Marpol; - identify and work out a solution to operational problems in accordance with relevant IMO legislation; - prepare a loading plan, execute it on a simulator and monitor and report the executed operations in a correct manner in accordance with the Marpol legislation; - take measures to prevent contamination of the environment by chemicals on board ships subject to the IBC Code.
Course content	The courses Advanced Tanker training Oil, Advanced Tanker training Gas and IGF, and Advanced Tanker training Chemicals are an advanced continuation of course module Basic Tanker training for Oil, Chemicals, Gas and IGF. They start with a common theoretical part in which the student first elaborates on the study of cargo calculations on board oil, chemical and gas tankers within more advanced issues. In addition, the student gets acquainted with the phenomenon of hammering and studies the possibilities of static electricity on board liquid cargo ships. The Advanced Tanker training Chemicals also includes an advanced training programme that enables the student to create a safety culture on board chemical tankers. In this course, the student learns how to perform and control cargo operations, be familiar with the properties of chemical cargoes, take precautions to prevent hazards, apply health and safety measures, respond to emergencies, take fire safety measures, take precautions to prevent environmental pollution and monitor and verify compliance with legal requirements. The first part aims at students becoming familiar with the equipment, instruments and equipment used to handle the cargo of a chemical tanker. The relevant laws and regulations from the IBC Code and Marpol are discussed in detail. The course then addresses the need for proper planning, the use of safe procedures and checklists for various cargo handling operations. This enables the student to identify, solve and prevent operational problems. Finally, specific cargo handling challenges on chemical tankers are discussed. In the labs the student uses the cargo handling simulator for chemical tankers and can practise the different cargo operations, as discussed in the theory. The student can gain experience in a controlled environment and improve himself/herself in cargo handling on the simulator. The course is in accordance with A-V/1-1-3 of the STCW code.

<table>
<tr><td>Learning outcomes</td><td>- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c)
- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d)
- Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e)
- Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h)</td></tr>
<tr><td>Examination</td><td><table><tr><td>Following
Module 1.1
-</td><td>Following
Module 1.2
-</td><td>Following
Module 2.1
-</td><td>Following Module 2.2
oral exam with written preparation and permanent evaluation</td></tr><tr><td colspan="4">Second session
oral exam with written preparation</td></tr></table></td></tr>
<tr><td>Caesura measures</td><td>- 100% presence in practical sessions mandatory to be evaluated in the first and second exam session;
- Obtain a minimum of 10/20 for each part of the exam to pass for this element.</td></tr>
<tr><td>Required study material</td><td>- Lecturer's course text available.

- No calculator allowed.</td></tr>
<tr><td>Recommended preliminary competences</td><td></td></tr>
<tr><td>Additional information</td><td>- International Chamber of Shipping /OCIMF. (latest ed.). International Safety Guide for Oil Tankers and Terminals (ISGOTT). Edingburgh, UK: Witherbys Publishing.
- International Chamber of Shipping /OCIMF. (latest ed.). Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases. Edingburgh, UK: Witherbys Publishing.
- International Chamber of Shipping. (latest ed.). Tanker Safety Guide Chemicals. London, UK: Marisec Publications.
- International Maritime Organization. (1973-1978). International Convention for the Prevention of Pollution from Ships (MARPOL) 1973-1978, as amended. London, UK: IMO.
- International Maritime Organization. (1974). International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended. London, UK: IMO.
- International Maritime Organization. (1978). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978, as amended. London, UK: IMO.
- International Maritime Organization. (latest ed.). International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code). London, UK: IMO.</td></tr>
</table>

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**ADVANCED TANKER TRAINING OIL (3 UC)**
Course element	**Advanced tanker training oil (HZS-NW-EXP-SWM441)**
Lecturer(s)	**Ynse JANSSENS, Denis STEVENS**
Lecturer in charge	Ynse JANSSENS
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	**Strict succession (must have followed and passed)** Basic tanker training (oil, gas, chem and IGF)
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	18/18
Semester + module(s)	**Semester 1, Module 1.1 6/-** | **Semester 1, Module 1.2 12/-** | **Semester 2, Module 2.1 -/18** | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - correctly interpret physical and chemical properties of liquid oil cargoes; - safely plan, carry out and monitor loading, discharging and tank cleaning operations on board oil tankers; - take measures to prevent pollution of the environment by the release of oil or oily products; - take measures to prevent hazards; - check and follow the agreement with the prevailing legislation with emphasis on SOLAS, MARPOL Annex 1, OPA90 and the relevant technical codes and regulations concerning IG & COW; - operate the simulator; - name the different parts of the loading and unloading process; - outline the piping used to load and/or unload a tanker; - completely unload a tanker; - manage tank cleaning; - identify problems/errors and work out solutions/alternatives; - use and interpret the ODME; - act independently in case of alarms.
Course content	The courses Advanced Tanker training Oil, Advanced Tanker training Gas and IGF en Advanced Tanker training Chemicals are an advanced continuation of the Basic Tanker training for Oil, Chemicals, Gas, and IGF. They start with a common theoretical part in which the student first elaborates on the study of cargo calculations on board oil, chemical and gas tankers within more advanced issues. In addition, the student gets acquainted with the phenomenon of hammering and studies the possibilities of static electricity on board liquid cargo ships. The course Advanced Tanker training - Oil deals minimum with the issues of storage, handling and transport of crude oil in accordance with the STCW2010 Specialized Training For Oil Tankers". - Model Course 1.02. The topics to be explored are Inert gas, crude oil washing, ullaging and sampling, STS, bunkering and bunker fraud. On the simulator, the student works on the basis of knowledge acquired in the 3rd Bachelor. In the Master the emphasis is on the oil tanker. In the labs, the student gets to know the activities in depth from the moment of arrival into port until the ship is fully unloaded. The following items will be covered: debottoming, ballasting, tank stripping, crude oil washing, internal stripping, ODME, heavy weather ballast, tank cleaning, and oil record book.

Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of applied technical sciences (mastSW-d) - Have an advanced understanding of one or more technical specialisations in line with their strengths and interests (mastSW-e) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h)
Examination	Following Module 1.1 - Following Module 1.2 - **Following Module 2.1 permanent evaluation** **Following Module 2.2 oral exam with written preparation** **Second session** **oral exam with written preparation**
Caesura measures	- 100% presence in practical sessions mandatory to be evaluated in the first and second exam session; - Obtain a minimum of 10/20 for each part of the exam to pass for this element.
Required study material	- Lecturer's course text available. - No calculator allowed.
Recommended preliminary competences	
Additional information	- Baptist, C. (2000). *Tanker Handbook for Deck Officers.* Glasgow, UK: Brown, Son & Ferguson Ltd. - Bruhn, C. (latest ed.). *Dr. Verwey's Tank Cleaning Guide.* Dassendorf, Germany: ChemServe. - Huber, M. *(latest ed.)*. *Tanker operations: A handbook for the person-in-charge.* Pensylvania, US: Schiffer Pub Ltd. - International Chamber of Shipping /OCIMF. *(latest ed.)*. *Clean Seas Guide for Oil Tankers,* Edingburgh, UK: Witherby Seamanship International. - International Chamber of Shipping /OCIMF. *(latest ed.)*. *International Safety Guide for Oil Tankers and Terminals (ISGOTT).* Edingburgh, UK: Witherbys Publishing. - International Chamber of Shipping. (latest ed.). *Clean seas guide for oil tankers.* London, UK: ISC. - International Chamber of Shipping. (latest ed.). *Ship to ship transfer guide.* London, UK: ISC. - International Chamber of Shipping. *(latest ed.). Tanker Safety Guide Chemicals. London, UK:* Marisec Publications. - International Chamber of Shipping. *(latest ed.). Tanker Safety Guide Liquified Gas. London, UK:* Marisec Publications. - International Maritime Organization. (1973-1978). *International Convention for the Prevention of Pollution from Ships (MARPOL) 1973-1978, as amended*. London, UK: IMO. - International Maritime Organization. (1974). *International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended.* London, UK: IMO. - International Maritime Organization. (1990). *Inert Gas Systems (IMO-860E).* London, UK: IMO. - International Maritime Organization. (latest ed.). *International Code of Safety for Ships using gases or other low-flashpoint fuels (IGF)*. London, UK: IMO. - Intertanko. (latest ed.). *Effective crude oil washing.* Oslo, Norway: Intertanko. - Marton, G. (1992). *Tanker Operations: A Handbook for the Ship's Officer.* California , US: Cornell Maritime Press. - Solly, R. (2011). *Manual for oil tanker operations.* Edingburgh, UK: Witherby Seamanship International.

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**ADVANCED MARITIME ECOLOGY AND TECHNOLOGY (3 UC)**
Course element	**Advanced maritime ecology and technology (HZS-NW-EXP-SWM461)**
Lecturer(s)	**Raf MESKENS, Geert POTTERS**
Lecturer in charge	Geert POTTERS
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture and practical exercises
Other teaching methods	Group work Demonstration
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/12
Semester + module(s)	Semester 1, Module 1.1 -/- | Semester 1, Module 1.2 -/- | **Semester 2, Module 2.1 12/6** | **Semester 2, Module 2.2 12/6**
Learning objectives	At the end of the course, the student is expected to be able to: The student makes connections between the environmental problems in contemporary society and various economic, social and cultural drivers; The student identifies different ecosystem services and analyzes their role in a given process or ecosystem; The student develops a critical attitude in discussions about technological developments and makes the necessary reflections with regard to their impact on the environment and nature; The student visualizes scientific information in a useful way for communication in a subject-specific, research-driven context.
Course content	This course starts with a thorough discussion of sustainable development as a core concept in general environmental theory and philosophy. On the basis of recent environmental reports and publications, the students learn to make connections between economics, ecology and the social fabric of the 21st-century society and to critically approach the processes and drivers behind these processes. The course elaborates on this based on the concept of ecosystem services and applies this in three themes: - biodiversity, linked to a discussion of the phenomenon of overfishing. Through this theme, students learn to identify different ecosystem services and explain their importance, - the climate crisis, linked to the global energy challenges. The students also analyze the possible energy transitions in shipping and identify arguments for and against the various options that exist there (LNG, hydrogen, biofuel, ...), - the impact of **pollution** on life on this planet, from individual organisms (people) to entire ecosystems. The students thus deepen their knowledge of environmental legislation from their bachelor courses. Subsequently, the student integrates these ecological insights with the needs and characteristics of recent maritime technological developments, by means of guest lectures and/or company visits. After this, the student makes his/her own critical analysis of a given theme, in a small group, deepens an ecological and/or technological subject, and designs a scientific poster about it.

<table>
<tr><td>Learning outcomes</td><td>- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c)
- Independently set up and carry out a scientific maritime research project at the level of a beginner researcher; select and correctly apply relevant research methods and techniques; critically process and scientifically report the results of this research (mastSW-i)
- Bear responsibility as an expert in safety and sustainability (mastSW-k)
- Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)</td></tr>
<tr><td>Examination</td><td><table><tr><td>Following Module 1.1
-</td><td>Following Module 1.2
-</td><td>Following Module 2.1
-</td><td>Following Module 2.2
oral exam with written preparation</td></tr><tr><td colspan="4">Second session
oral exam with written preparation</td></tr></table></td></tr>
<tr><td>Caesura measures</td><td></td></tr>
<tr><td>Required study material</td><td>- Lecturer's course text available.

- No calculator allowed.</td></tr>
<tr><td>Recommended preliminary competences</td><td>Maritime ecology and environmental regulations
Maritime English - part 3</td></tr>
<tr><td>Additional information</td><td>- International Maritime Organization. (1973-1978). International Convention for the Prevention of Pollution from Ships (MARPOL) 1973-1978, as amended. London, UK: IMO.
- Potters, G. (2013). Marine Pollution. bookboon.com
- Wilson, L. (2012). The Paint Inspector's Field Guide. Capelle aan den Ijssel, The Netherlands: TQC.</td></tr>
</table>

ECTS Information Package

Antwerp Maritime Academy

Programme	Master in Marine Engineering
Course	**DATA ANALYTICS AND AI FOR THE MARITIME INDUSTRY (3 UC)**
Course element	**Data analytics and AI for the maritime industry (HZS-WE-TE-SWM411)**
Lecturer(s)	**Birger RAA**
Lecturer in charge	Birger RAA
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	Semester 1, Module 1.1 -/- | Semester 1, Module 1.2 -/- | **Semester 2, Module 2.1 16/-** | **Semester 2, Module 2.2 8/-**
Learning objectives	At the end of the course, the student is expected to be able to: - understand the fundamentals and concepts underlying commonly used data analytics and AI techniques; - distinguish between training, testing and validating a data analytics model - identify possible applications of AI techniques and their improvement potential in a maritime context; - solve specific problems using the basic methods taught in this course; - assess the limitations and ethical consequences of AI techniques.
Course content	In this course, the student discovers what artificial intelligence (AI) is, including relevant terminology and an overview of various AI techniques and applications. The student examines the societal context of AI, discussing the impact of AI on society, regulations, and ethical aspects. The student delves into data analytics and learns to understand and apply descriptive, predictive, and prescriptive models. Within the domain of machine learning, the student distinguishes the difference between supervised and unsupervised learning, and explores neural networks, Markov Decision Processes, and Reinforcement Learning. The student tests various AI applications. In the first part of the applications, the student focuses on classification, clustering, and computer vision. In the second part, the student examines AI applications such as forecasting, navigation, and planning.
Learning outcomes	- Manage and control complex technical systems on board ships and maritime installations based on a thorough understanding of exact sciences (mastSW-c) - Have advanced understanding of digital system controls and data processing (mastSW-g)
Examination	Following Module 1.1 - | Following Module 1.2 - | Following Module 2.1 - | **Following Module 2.2 oral exam with written preparation and written exam and permanent evaluation** **Second session oral exam with written preparation and written exam and permanent evaluation**
Caesura measures	
Required study material	- Lecturer's course text available. - Scientific and graphic calculators allowed.
Recommended preliminary competences	Differential and integral calculus - part 1 Integral calculus - part 2 and statistical methods for scientific research

Additional information	- Joshi, A.V. (2023). *Machine Learning and Artificial Intelligence*. Cham, Switzerland: Springer. - Lindholm, A., Wahlström, N., Lindsten, F., & Schön, T. B. (2022). *Machine Learning: A First Course for Engineers and Scientists*. Cambridge: Cambridge University Press. - Russell, S., Norvig, P. (2021). *Artificial Intelligence, Global Edition*. (4th ed.). Pearson Education. https://elibrary.pearson.de/book/99.150005/9781292401171

ECTS Information Package

Antwerp Maritime Academy

Programme	**Master in Marine Engineering**
Course	**ANALYSIS OF SHIPPING MARKETS (3 UC)**
Course element	**Analysis of shipping markets (HZS-WE-HT-SWM421)**
Lecturer(s)	**Theo NOTTEBOOM**
Lecturer in charge	Theo NOTTEBOOM
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	Semester 1, Module 1.1 -/- | Semester 1, Module 1.2 -/- | Semester 2, Module 2.1 -/- | **Semester 2, Module 2.2 24/-**
Learning objectives	At the end of the course, the student is expected to be able to: - analyse and integrate business and economic issues related to the four markets in shipping in a scientifically sound manner; - understand and put complex and current problems in the four markets in the right context; - reflect on the functioning of the four markets and, on the basis of their own reflection, suggest adequate solutions in an uncertain context; - use the specific concepts and terminology associated with the shipping markets; - search for and interpret relevant data related to the market forces.
Course content	Shipowners trade in four different markets: the newbuilding market, the freight market, the sales and purchase market and the demolition market. This course aims to provide students with a thorough understanding on the functioning of the four shipping markets from a practical point of view. The course is composed of four interrelated parts, each focusing on one of the four shipping markets.
Learning outcomes	- Act in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) A-III/1, A-V and A-VI, for Engineer Officers on seagoing vessels (mastSW-a)
Examination	Following Module 1.1 - | Following Module 1.2 - | Following Module 2.1 - | **Following Module 2.2 written exam** **Second session written exam**
Caesura measures	
Required study material	- Lecturer's course text available. - No calculator allowed.
Recommended preliminary competences	
Additional information	

ECTS Information Package

Antwerp Maritime Academy

Programme	**Master in Marine Engineering**
Course	**PORT MANAGEMENT AND POLICY (3 UC)**
Course element	**Port management and policy (HZS-WE-HT-SWM431)**
Lecturer(s)	**Theo NOTTEBOOM**
Lecturer in charge	Theo NOTTEBOOM
Educational programme	**Master in Marine Engineering**

Method of teaching	Formal lecture
Other teaching methods	
Instruction language	English
Required preliminary credit(s)	
Units of credit (UC)	3
Hours of formal lecture/ practical exercise	24/-
Semester + module(s)	Semester 1, Module 1.1 -/- | Semester 1, Module 1.2 -/- | **Semester 2, Module 2.1 24/-** | Semester 2, Module 2.2 -/-
Learning objectives	At the end of the course, the student is expected to be able to: - analyse and integrate business and economic issues related to port management and policy in a scientifically sound manner; - understand complex and current problems in ports and place them in the right framework; - reflect on the operation of ports and to propose adequate solutions in an uncertain context on the basis of own reflection; - use specific concepts and terminology related to port operations, policy and management; - look up and interpret relevant data concerning the operation of ports.
Course content	This course aims to develop a thorough grasp of different aspects of port activities by providing a detailed understanding of the principles and practices of port management within the framework of global transportation systems. The course also addresses key elements in port policy at the European level and at the level of individual states (both in Europe and outside of Europe). The course is composed of three interrelated parts: (1) the market environment of seaports, (2) port management and (3) port policy.
Learning outcomes	- Have an advanced understanding of inspection and survey of ocean-going vessels and maritime installations (mastSW-f) - Independently analyse complex problems in often unpredictable situations and develop and implement meaningful solution strategies (mastSW-h) - Adopt an attitude of lifelong learning and personal and professional development, fuelled by critical reflection on one's own performance and detection of new developments in nautical technical sciences (mastSW-l)
Examination	Following Module 1.1 - | Following Module 1.2 - | Following Module 2.1 - | **Following Module 2.2 written exam** **Second session written exam**
Caesura measures	
Required study material	- Lecturer's course text available. - No calculator allowed.
Recommended preliminary competences	
Additional information	- Notteboom, T. (ed.) (2006). *Ports are more than piers.* Antwerpen, Belgium: De Lloyd. - Notteboom, T., A. Pallis and J-P Rodrigue (2021) Port Economics, Management and Policy, New York: Routledge.

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Antwerp Maritime Academy

Required preliminary credits - summary

Master in Marine Engineering

Academic year 2025-2026

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B-2030 Antwerpen

Antwerp Maritime Academy

Required preliminary credits - summary (first enrolment from 2023-24)

Master in Marine Engineering

Academic year 2025-2026

Master in Marine Engineering

Faculty of Marine Engineering	
MARINE ENGINEER SKILLS TRAINING - PART 4, SEMINARS - PART 2 AND MULTIDISCIPLINARY SIMULATOR EXERCISES - PART 3	**Strict succession (must have followed and passed)** MARINE ENGINEER SKILLS TRAINING - PART 3, SEMINARS - PART 1 AND MULTIDISCIPLINARY SIMULATOR EXERCISES - PART 2
ADVANCED CONTROL TECHNOLOGIES	**Standard succession (must have followed)** SHIP AUTOMATION - PART 2
Faculty of Sciences	
MASTER THESIS	**Standard succession (must have followed)** BACHELOR TERM PAPER AND SCIENTIFIC RESEARCH METHODS
THE HUMAN ELEMENT IN A MARITIME ENVIRONMENT	**Standard succession (must have followed)** GENERAL AND INTERCULTURAL COMMUNICATION AND MCRM
Nautical Faculty	
ADVANCED TANKER TRAINING GAS AND IGF	**Strict succession (must have followed and passed)** BASIC TANKER TRAINING (OIL, GAS, CHEM AND IGF)
ADVANCED TANKER TRAINING CHEMICALS	**Strict succession (must have followed and passed)** BASIC TANKER TRAINING (OIL, GAS, CHEM AND IGF)
ADVANCED TANKER TRAINING OIL	**Strict succession (must have followed and passed)** BASIC TANKER TRAINING (OIL, GAS, CHEM AND IGF)