The Postgraduate Diploma Programme of Maritime Autonomous Surface Ships (MASS)

Identification of educational needs of the MASS business expert at Xamk
AutoMare EduNet Project 2023

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ABSTRACT

With continued technological development and potential self-sufficiency in the shipping industry, maritime autonomous surface ships, or MASS, are not just a dream, but a reality. The maritime industry will change significantly in the following years. Currently, the use of maritime autonomous surface ships is an area of active development and soon we will see autonomous ships either remotely or even automatically controlled alongside traditional ships. In the future there will be the required specialists ready to work with them. Then, as soon as an automated ship is in the general flow among other ships, which can be both automated and non-automated, safety and liability issues go to another level.

Without comprehensive preparation for the future, companies will lose their competitiveness in the grip of this change. The mission of the maritime industry and educational institutions is to help companies and people working in the field to face the changes with sufficient early preparation.

Change always contains both risks and opportunities. The operators involved in the implementation of automated ships and unmanned navigation will require a high level of professionalism, which can be acquired through well-designed training and a specific programme. With the right kind of education programme, maritime industry students will learn to cope with the risks of change and take advantage of the opportunities it brings.

This article is part of the AutoMare EduNet project.

Keywords: MASS, Autonomous Ships, Maritime Skills, Educational Programmes, Postgraduate Diploma

CONTENTS

1 INTRODUCTION

The purpose of this article is to study the skills needed in developing and/or operating maritime autonomous surface ships and if there is a need for a postgraduate diploma program. The training programme should prepare students for MASS in the maritime industry. The goal is also to make the transition to MASS as easy as possible for Xamk's teaching personnel. As a result, Xamk's current course offering has been analysed and compared to the MASS talent demand on the market.

A key observation about MASS business is the absence of a general MASS business expert training programme and its need in different companies. There are several universities and colleges that offer a minor specialisation in MASS as part of their education in the maritime field. A programme where each training module is built purely from MASS's point of view is missing. This need is met with this report and the potential new training program. The Postgraduate Diploma Programme for MASS comprises 60 credits.

2 BACKGROUND AND OBJECTIVE OF THE ARTICLE

One of the authors of this study came up with the idea of comparing the marine industry to the human vascular system. Just as blood vessels carry blood and sustain the vitality of a person, the maritime industry plays a vital role in world trade, accounting for approximately 90 per cent of goods transportation (World Bank 2021). Efficient and reliable transportation is crucial for global development and vitality. Therefore, it is imperative to prioritise the education of the Finnish maritime industry to ensure its leading position in the world.

South-Eastern Finland University of Applied Sciences (hereafter referred to as Xamk) is one of the leading maritime higher education institutions in Finland. Xamk offers 44 bachelor's and 29 master's degree programmes (Xamk_2, 2023).

According to Oksavik et al. (2020, 15), cities contribute 80 per cent of global GDP. Cities have become synonymous with productivity and competitiveness. Cities serve as centres of knowledge, innovation and specialisation in production and services. Cities are becoming more and more competitive in attracting the best businesses and the best talent. This means that Xamk and the city of Kotka is competing for the best talent in the maritime industry.

This article is part of the AutoMare EduNet project. The aim of AutoMare EduNet is to ensure high-level education related to autonomous shipping in the maritime cluster. The project is funded by the Finnish Ministry of Education and Culture. (Xamk_1, 2023)

One objective of the article is to find out what kind of lack of knowledge there is concerning maritime autonomous surface ships, with future reference to MASS in the education provision of Xamk. Another objective is to identify which existing courses could be used as they are or with minor changes in MASS postgraduate programmes.

The article focuses on the training programme focused on the MASS expert role. The article does not consider other significant trends in the maritime sector, such as the construction or design of independent ships. Moreover, the Command or MASS Master of the vessel, RCC/ROC Operation Director, MASS Remote Operator or Watchkeeper, or MASS Payload Operator are beyond the scope of this project.

By 2030, a variety of MASS skills will be required. In this article, an Xamk training programme and new courses are developed, with the target being a generalist or a MASS business expert. The reason for this is

that in the early stages of MASS, an expert in the field is more likely to be employed. Specialised expertise can later be built into the expertise of an expert area, such as cybersecurity or game design. The student programme will be the Postgraduate Diploma Programme, comprising 60 credits.

The article consists of three main parts. First, we study MASS in general and what kind of training there is and should be. Second, we build the profile of the graduate from the MASS programme and what study modules could be used in future MASS programmes at Xamk. We also go through the curriculums of Xamk, and we use the contents of different courses to create a new programme. Finally, we present the curriculum in the future MASS programme at Xamk in PowerPoint form.

Maritime workforce competence should certainly be analysed and transformed according to the standards of MASS. It is absolutely essential to get maritime experts' opinions on the issues of autonomous seafaring and to understand their comprehensive attitude towards educational and professional issues in relation to the new reality. It was decided to study their opinion with the help of a special questionnaire enquiring about the operational risks of MASS, training and educational needs, forms of learning, and mariners' attitudes towards MASS. The questionnaire was sent as a link to seafarers, experts and maritime professionals.

3 WORKING METHOD

It was decided that the working method should be a literature review and questionnaire sent to companies involved in MASS. Also, the study plans of 29 educational programmes from Xamk's educational offer were reviewed to see which were suitable for the curriculum design of MASS. When looking through Xamk's training offerings, only one course was found that directly dealt with smart ships. This was the Intelligent Ships course, part of the Bachelor of Engineering and Electrical Marine Engineering programme, and its length was 1.5 credits. The content of the course was digitalisation in ship technology, the internet of things (IoT), remote monitoring and control, and augmented reality.

The combination of a literature review, questionnaire and Xamk's educational offerings has helped create the MASS expert profile and areas of expertise. The profile has been a guiding light in the development of the MASS expert's study programme.

While studying the literature, facts on interesting factors were gathered. The intention was to learn about the latest changes in the maritime industry and their effects on the job roles and duties in maritime, and recognise the required content of the MASS postgraduate diploma study plan.

The literature was gathered through various sources using the following keywords such as in internet searches: MASS (Maritime Autonomous Surface Ship), autonomous ships, MASS course and MASS training. A total of 28 essential publications on the topic were found. In this three-month research period, the results of examined and analysed publications were precious. A deeper analysis would have been possible if we had more time.

The gathered information was selected and analysed to provide the theoretical basis for the programme. For the next step of sorting information, data collection by questionnaire with a list of 15 carefully formulated questions was selected. This method enables a wide elicitation of opinions, but mostly it was chosen in order to give experts the opportunity to answer in their own time, give them time to think, and not to bother with organising interviews. However, we offered our contact information if there was a specialist who preferred to engage in an interview instead of an online survey.

In order to gain a realistic picture for the future MASS programme, these questions should be answered by experienced professionals in Maritime navigation, so the respondents were selected from among the

shipping crews, seafaring personnel and those related to shipping positions in Finnish companies and ports. As respondent organisations, we selected the port of HaminaKotka, Arctia Oy, MeriAura Oy, Mopro Oy, Prima Shipping Oy, Terramare Oy, Viking Line Oy, Finnshipping and other experienced seafarers as the most relevant stakeholders.

Based on the responses, we considered the possible postgraduate programme for training, attempted to find possible gaps, and pointed out some topics for further consideration.

4 MARITIME AUTONOMOUS SURFACE SHIPS (MASS)

Our focus in this chapter will be on reviewing literature related to maritime autonomous surface ships and education programs related to MASS. We will also present what kind of program should Xamk focus on.

4.1 What is MASS and what is happening in the maritime industry?

According to London Economics Ltd (2021, iii), the maritime and smart shipping industries contain the following segments: 1) the shipping industry, including transport of freight and passengers; 2) the port industry, concerning customs activities, management, warehousing, cargo, and passenger handling; and 3) the marine engineering and scientific industry (this segment is responsible for shipbuilding, marine science and other academic activity), 4) the marine business services industry, dealing with legal activities, insurance, shipbroking and financial operations; and 5) the leisure marine industry, including boat-building and recreational activities.

The top ten technological trends for the maritime sector are: 1) additive manufacturing, 2) artificial reality (AR) and virtual reality (VR), 3) big data, 4) drones, 5) distributed ledger technology, 6) machine learning and artificial intelligence (AI), 7) materials, 8) propulsion technology, 9) robotics, and 10) sensors (Technology and Innovation in UK Maritime: The Case of Autonomy 2019, 39). According to the stakeholders of the UK Department for Transport, the most important technologies in maritime are digital connectivity and shore control centres (Technology and Innovation in UK Maritime: The Case of Autonomy 2019, 39). All these trends are related to autonomous ships. Also, the EU wants 30 per cent of goods transported over 300 km to be carried by sea or rail. The objective is that this will be achieved by 2030. It is a driving force of autonomous solutions at sea and on the railways (Blanke et al., 2017, 10).

In other words, it can be said that by 2030, the importance of the maritime industry will grow in the EU area, and the digital revolution will deeply affect it. MASS has a very important role in today's development of the maritime industry.

Basically, autonomous ships are remotely controlled by shore control centres (SCC), and they have limited ship crew or no crew at all. The technology used in MASS will be many times higher than traditional vessels. The introduction of autonomous vessels into

operation makes it possible to reduce operating costs, such as the salaries of officers and ratings, the supply of crew members during voyages, and others, but at the same time the remote control of such a vessel increases operating costs on land. It is believed that future ships will not be of interest to pirates, since they will not have a crew that can be taken hostage, and it will be impossible to handle cargo systems manually. However, it is not clear who is responsible in the event of a ship failure, in the absence of a crew. The change that the maritime industry is going through brings both possibilities and risks. The right time to be a part of this transform to the modern maritime technology is now.

There are several definitions of autonomous ships. The most used are the International Maritime Organization's (IMO, 2018) four levels of categories: 1) Ship with automated processes and decision support; 2) remotely controlled ship with seafarers on board; 3) remotely controlled ship without seafarers on board; and 4) fully autonomous ship. Also, Lloyd's Register (2019), and Sheridan and Verplank (1978) have their own definitions of autonomous ships.

In this article we shall use IMO's model to describe autonomous ships (IMO, 2018):

1. The first level of autonomy: Some operations can be fully automated, but seafarers operate and control the systems and functions of the ship.
2. The second level of autonomy: Seafarers are on board, but the ship is controlled and operated from another location, for example from the shore control centre.
3. The third level of autonomy: The ship has no seafarers on board and it is controlled and operated for example from the shore control centre.
4. The fourth level of autonomy: The ship makes all decisions and actions by itself. There is no human control of the ship.

Autonomous ships will have a major impact on the maritime industry. For example, the ship's construction will change, and a new service provider will arise. The impact will not be limited to ships. Also, the ports will be automatically operated (Applying Athukorala 2021, 4). The logistic transport chains of goods and people will use artificial intelligence to optimise transport.

Marine stakeholders include onboard and onshore seafarers, insurance companies, freight and bunker companies, research institutions, universities, and training centres. Autonomous vessels will have system integration and control, system management, and maintenance. One of the most important safety issues provided by such vessels will be cybersecurity. Also, autonomous vessels will use big data analysis, smart sensors and new ways of communication. Additionally, autonomous ships will affect maritime rules and regulations (Mohamad et al., 2022, 8). The marine industry has recently experienced significant changes. One of these transitions is changing the paradigm of autonomous vehicles in technological progress, including big data, artificial intelligence, robots, the internet of things, and e-navigation (Mohamad et al., 2022, 3). In addition, autonomy, automation, unmanned operations, big data, enterprise connectivity and analytics will continue to grow in the marine industry. Therefore, communication and coordination with marine, shipbuilding and

port industries are needed to fulfil MASS (Shahbakhsh et al., 2022, 38, 10–18).

The development of MASS involves the integrated application of technologies. These technologies include cyber-physical systems, integrated bridge systems and environmental information perception. MASS also consists of collision avoidance path planning, track control, remote control, fault diagnosis technologies for equipment and systems, and hull condition monitoring. Additionally, it is important to use satellite and communication systems and network information security. Similarly, the internet of things, cloud computing, big data and automation are part of MASS (Deling et al., 2020, 12).

The marine industry is usually seen as slow to embrace new technologies. The reasons are the following: Technology failures that lead to incidents are often front-page news. The IMO can be slow to react, so companies are encouraged to delay investment. Marine transportation is globally competitive and profit margins may be low, so shipowners do not want to invest. The new technology is expensive, and the risks of failure are high. But the tables are turning, as the smart shipping sector is coming (London Economics Ltd 2021, 28). In 2017 shipping company Maersk's cyberattack cost $300 million in profits. Nowadays the marine industry is aware that physical shipping operations are vulnerable to digital disruption (Baraniuk, 2017).

According to Athukorala (2021, 1–2), the disadvantages of autonomous ships are the risk and vulnerability of information technology for hacking, safety risks, risk of employment, high capital investments, and risk of monitoring and offshore facilities. The advantages of autonomous ships include the elimination of sea accidents and human error, the use of the entire space of the ship, and the reduction of ship crew and total operational costs (Athukorala 2021, 1–2). The growing use of technology in the sector may lead to more flexible work and land-based operations. This helps reduce the mental and physical strain caused by long periods of isolation at sea (Technology and Innovation in UK Maritime: The Case of Autonomy 2019, 39).

Autonomous systems, for example, are or will come from docking vessels at the docks. They will be used in mine-sweeping operations and long-endurance missions in harsh climates. Autonomous machines will explore the deep ocean and survey the world's seas. They will guide a vessel to harbours via specific routes (Department for Transport 2. 2019, chapter 6.3 Future of shipping). There are several autonomous vessels like cargo ships, passenger ships, minor island ferries, tugs, barges, and supply and service vessels, and autonomous surface vessels for servicing underwater and drone units for offshore inspection (Blanke et al., 2017, 14-15).

Automation will take jobs from different sectors. Machines are easier to replace for routine tasks. There will be autonomous buses, artificial intelligence will make loan decisions, and robot lawyers have already replaced 3,000 employees at Sberbank (World Bank Group 2019, 21, 24). Automation will also take jobs from the maritime industry, but at the same time, new professions will arise.

Bolbot et al. (2022, 47) provide examples of jobs that will be impacted by MASS.

These include policymakers, lawyers, insurance agencies, researchers, consultants, IT engineers, ship charterer employees and ship equipment manufacturers. Also, different kinds of developers, analysts and testers work in logistics and maritime products.

When planning for the seafarers of the future, the automation of routine tasks should be taken into account and students should be taught skills that cannot be replaced by digital or robotic technologies. According to the World Bank Group (2019, 2, 23), the skills and know-how that cannot be replaced include managing, group work, problem-solving and critical thinking. Basically, cognitive and socio-behavioural skills are becoming more important to employees.

From an industrial point of view, autonomous vehicles are already being developed in various modes of transport, such as trains, cars and planes. Consequently, MASS is having a significant impact on ships, equipment and devices, as well as on marine and port infrastructure in the marine industry (Mohamad et al., 2022, 2).

Meadow et al. carried out a survey and a discussion event, in which approximately 600 influential people from the maritime industry participated in 2018 (2018, 4). Only 17 per cent of 604 participants agreed that remote and autonomous technology providers understand the shipping sector's requirements (Meadow et al., 2018, 7). This means that in maritime education, it is important to teach both seamanship and information technology.

In the Meadow et al. survey, 65 per cent of the participants agreed or strongly agreed that the adoption of autonomous technology could create a competitive advantage for shipping companies. Among the different types of vessels, the results of the survey showed that cargo transport was most likely to benefit from remote and autonomous operations (2018, 11-13). In other words, it is important to prepare future maritime students for autonomous ships, because they will generate a competitive advantage for companies.

The survey also found that 64 per cent of the participants agreed or strongly agreed that the current workforce at sea could be trained to handle the remote operation of autonomous ships. Some 85 per cent of the respondents agreed or strongly agreed that seafarers will remain an essential component in the long-term future of shipping (2018, 17–18). These findings support lifelong maritime education and the postgraduate diploma programme for the Xamk MASS programme.

Today, MASS is suitable for vessels engaged in short-term trade/travel in resource-rich areas where the seas are calm. The success of MASS depends on routes, regional geography, infrastructure readiness/availability, market dynamics, financial resources and competent human resources. This includes education and training programmes and regulatory preparedness (Korea Maritime Institute et al., 2023, 40).

It is important for marine professionals to be able to switch between value chains. This means that ship crews should be able to develop the skills that will help them move from ships to shore to work in marine industries (Oksavik et al. 2020, 43).

4.2 Education programmes related to MASS

A regular term used for education is MET, which is short for Maritime Education and Training (Pundars 2020, 25). According to Pundars (2020, 49) who interviewed sixteen people from the maritime field, authorities, and educational institutions, maritime education must change in the way that it supports autonomous shipping, among other things.

Marine organisations would like the IMO to send a clear message and indication on the type of education and training, and the experience required to work for MASS. Without clarity, it is difficult to plan and prepare for the future (Korea Maritime Institute et al., 2023, 28–29).

According to Korea Maritime Institute et al., (2023, 16), while the future of MASS promises many opportunities for the maritime industry, it will also provide many challenges. A key challenge will be changing roles, responsibilities, qualifications, certifications, designation, employment, seafarer learning, and ways of dealing with matters. MASS will have an impact and generate new educational needs in the maritime industry as a whole. New business models and professions may be created thanks to MASS (Bolbot et al., 2022, 47).

Bogusławski et al. conducted the survey and asked members of the International Association of Maritime Universities (IAMU) to distribute the questionnaire to their students. The survey was completed in the spring of 2020 with 505 students responding (2022, 330). Forty-one per cent of the respondents reported having only some comprehension of the potentially disruptive technology of autonomous ships (Bogusławski et al., 2022, 338). Some 26.4 per cent responded that the MASS coverage is equitable or fully satisfactory. In total, 41.9 per cent responded that issues related to automation of the shipping industry are not covered at all in their MET programme or are poorly covered. As a result, a significant portion of the respondents stated that their knowledge of MASS technology and other disruptive changes in the marine industry was minimal (Bogusławski et al., 2022, 332).

Bogusławski et al. (2022, 338) point out that today, the framework for training future navigators and engineers is based on the International Convention on Standards of Training, Certification and Watchkeeping. For this reason, some METs may choose to provide only what is legally required for today's expeditions, while neglecting a more general education.

The United Kingdom's vision for 2050 is diversified and rewarded. The UK workforce for 2050 will encourage young people to pursue a maritime career. It is expected that future British mariners will easily transition between sea and shore roles. They will possess IT skills and continuous professional development that allow them to update their skills as technology advances. In the future, the maritime employee should possess strong science, technology, engineering and maths (STEM) skills (Department for Transport 2. 2019, point 36).

The competency profile of the marine sector will change considerably over the next thirty

years. STEM topics will become more important as jobs become more specialised and data is based on new technologies. The ability to create, operate and maintain autonomous and technological systems will be one main part of the maritime industry. (Department for Transport 2. 2019, point 39)

The UK sees an opportunity to build on high-quality training programmes to meet new requirements. They see that upskilling the workforce will take advantage of emerging technologies such as robotics and artificial intelligence. Also, the workforce has to adopt short training packages and regularly review what skills are needed to have a skilled workforce (Department for Transport 2. 2019, point 39).

Thus, the seafarers' roles and responsibilities in response to MASS development are changing dramatically because the new workplace requires seafarers who are able to continuously learn new skills as existing technologies mature or the new ones emerge (Korea Maritime Institute et al., 2023, 17). Without lifelong learning, individuals may suffer in terms of professional advancement. It is important to map career paths and develop educational programmes for career development (Department for Transport 2. 2019, point 40).

The United Kingdom's success in providing the best skills resides in its educational system. The development of the UK's leading maritime training programmes in their colleges and universities as well as in workplace learning played a key role in this process. The strong partnership between universities, training institutions, government, regulatory bodies and direct maritime enterprises in the UK ensured the main maritime programmes (Department for Transport 2. 2019, chapter 7. People).

Training and education must continue throughout life, giving the workforce the support it needs to access new opportunities in emerging maritime roles (Department for Transport 2. 2019, chapter 7. People).

By 2050, the British marine sector will increasingly be a high-tech industry with a highly skilled and diversified workforce. The focus will be on acquiring a wider range of transferable skills, supported by continuous learning, rather than on career specialisation (Department for Transport 2. 2019, chapter 7. People).

Individuals will engage in professional development programmes early on in their marine careers. This will enable them to make a seamless transition to the service sector and other maritime roles onshore (Department for Transport 2. 2019, point 7.3).

Wahlström et al. (2015, 1038, 1041–1043) conducted a literature review of autonomous and remote operations in various fields such as aviation, forestry, automobiles, metro systems, space operations, military operations and cranes. They looked at potential issues in these areas and compared whether they could be the same in the shore control centres (SCCs) for unmanned vessels. While this article does not focus on SCCs, this learning can be considered when planning a training programme.

Pilots of unmanned aircraft faced problems such as, accidents during changes and transfers, and a lack of vehicle sensation. Based on the experience with cars, SCCs could face a behavioural adaptation. This could involve dangerously low safety margins, since remote operators themselves are not exposed to any physical hazards. In addition, skills may be degraded if automation and teleoperation fail. There is also a need for deep local knowledge. Container cranes constantly redirect to new tasks, which means they must continually redirect to the requirements of new tasks at small intervals. At SCCs, the workflow of various tasks may be overwhelming. It is also necessary to take into account the aggravation of the sense of spatial dimensions in the control of the video flow. Using forestry vehicles, they found a system of avoiding obstacles and planning routes. Similarly, the need for a comprehensive evaluation of objects can pose a significant challenge for unmanned vessels.

In the military, there are differences between opponents and others. Similarly, unmanned vessels should distinguish between vessels in need of assistance and pirates. Furthermore, inhumanity could be problematic if unmanned ships lack empathy and sensitivity to their environment. Ships must participate in salvage operations. In space operations, the long distance produced time delays.. This can be problematic if the delay impacts reflection and decision-making. With metro transit, the impact on unmanned vehicle operations requires a human understanding of the implied intentions of others. For unmanned vessels, this means that the system would have to be able to infer the intentions of other vessels. There is also a need for direct sharing of perspectives between actors in emergency situations. Sharing views between SCCs and authorities can be imagined – perhaps an emergency response could use vessel video images (Wahlström et al., 2015, 1038, 1041–1043). When planning future MASS education, it is important to teach students how to lead themselves and others and how human senses can distort reality through digital devices.

Lavidas (2020, 17) noted that MASS operators will need to enhance their specific skills in communication, legislation, maths, robotics and computer science. While this article does not focus on MASS operators, this learning can be considered when planning a training programme.

Samani has presented (2022, 22–32) different kinds of MASS courses and degree programmes offered by METs. These courses and programmes contain examples such as:

- Marine operations, automation of autonomous vessels, artificial intelligence, remote operations, cyber security and connectivity, classification, qualification and safety perspectives.
- The implementation of autonomous marine robots (both surface and underwater) with remote operation capability, and the use of artificial intelligence (AI) in these fields.
- Shipping economics and market sector analysis, systems availability and maintenance, inspection and survey, marine engineering simulation and modelling, onboard energy management and marine environment protection, advanced marine engineering, and maritime safety and risk.

- Science, mathematics, engineering, systems design and computing for ships, mechanics, structures and materials, thermo fluids, electrical and electronics systems, advanced computational engineering, marine engineering and autonomy, naval architecture, ocean energy and offshore engineering, and yacht and high-performance craft and maritime robotics.
- Autonomous mobile robots course, the concepts of which can be useful in MASS as the concepts of fleet control, navigation, safety, sensors and positioning are all concepts that can be used for application on marine vessels.
- Control and automation, where the principles and analysis of dynamic systems are related to automation systems, the use of programmable logic controllers and their design is covered. These courses can be offered as electives to support the studies of naval architecture
- Hydrodynamics, ship dynamics, principles of naval architecture, ship design portfolio and winter navigation, marine risks, and safety courses.

In Finland, Aalto University, the University of Turku, and Åbo Akademi University offer MASS content in their courses in maritime industry education. Their course offering includes courses for ship design and construction, ship ICT, AI, maritime law, supply and value chain management including logistics and transportation. Their course offering also includes cybersecurity, machine learning, autonomous systems, and smart environments. Their global innovation management is based on international business and entrepreneurship (Bolbot et al., 2022, 58–61).

According to Bolbot et al. (2022, 66) there are several universities around the world that offer education related to MASS. These include Shanghai Jiao Tong University, the Norwegian University of Science and Technology, Harbin Engineering University, the University of Strathclyde, Dalian University of Technology, the University of Lisbon, Wuhan University of Technology, Delft University of Technology, the University of Western Australia, National University of Singapore, Université de Toulon, the University of Southampton, the University of the Aegean in collaboration with the University of West Attica, and the Scottish Association for Marine Science.

Oksavik et al. (2020, 3, 40) suggest in their report that 21st century maritime professionals should have the competence and skill sets for the development of ships' onboard technologies, have soft skills in management and leadership, and have digital skills. They also suggest that providing courses such as open communication, teamwork, leadership and decision making to marine professionals is essential (Oksavik et al 2020, 43).

According to Korea Maritime Institute et al., (2023, 22) MASS research has concentrated mainly on technical aspects. This gives Xamk the opportunity to specialise at this stage in MASS's business expertise and students' soft skills.

However, when Xamk is planning the development of the Sea Captain degree by adding MASS teaching to it, it is good to use it in the planning publication: Bolbot V., Methlouthi O., Chaal M., Banda O. V., Toroody A. B., Tsetkova A., Hellström M., Saarni J., Virtanen S.,

Owen D., Lei S. & Basnet S. 2022. Identification and analysis of educational needs for naval architects and marine engineers in relation to the foreseen context of Maritime Autonomous Surface Ships (MASS). Aalto University, SCIENCE + TECHNOLOGY 2/2022. It has comprehensively analysed the additional competence needs of different maritime professions that MASS creates.

4.3 What kind of education programme in MASS should Xamk concentrate on?

In 2021, London Economics Ltd (2021, x) identified 215 relevant companies in the smart shipping industry in the UK. They divided the companies into four segments: 36 were labelled as in the smart port segment, 38 in the autonomous vessel sector, 68 offered on-board technologies, and 131 provided professional business services.

The above research also indicates that there is a need for business MASS experts. According to the study, 60 per cent of the companies operating in the UK smart ship industry operate in the business service sector. This strengthens the view of the business orientation of Xamk's MASS programme.

Maritime education and training (MET) must have an effective training methodology, including a cognitive, psychomotor and affective learning approach. Leadership skills and future challenges in MASS must also be involved (Mohamad et al., 2022, 8).

Kilpi et al. (2021, 71) carried out a survey for maritime industry representatives in 2019. They received a total of 226 responses. The survey response rate was over 15 per cent. In the survey, they investigated the importance of different fields of expertise in 2019 and five years from then, i.e. in 2024. In the maritime industry the main learning and competence needs were first, environmental regulations and technology; second, production methods and automation; third, ethicalness and responsibility; fourth, problem solving and innovativeness; and fifth, teamwork. Also, operation in a large network, competence management, understanding of customers' business, risk management, project competence and flexibility and change management were identified as important now and in the future.

According to Kilpi et al. (2021, 74), companies in the maritime industry are more interested in continuous learning and skills and competencies that could be considered less task-specific or functional. This finding support Xamks' future postgraduate diploma programme in maritime autonomous surface ships (MASS).

Based on the literature review of Xamk's already existing courses and their utilisation, the authors have prepared the following profile of a MASS specialist.

A MASS expert is a general practitioner. They have good knowledge and expertise in key areas affecting the MASS business. A MASS expert finds employment in an international company that develops or works with autonomous vessels. Their job description includes development of MASS activities in the enterprise, MASS as the business of the company, or control and management

of an autonomous vessel. They have excellent knowledge of the English language, understand the international maritime transport operating environment, and can analyse it. They know how the company, ships and ports work. The management of people, things and projects, as well as teamwork in an international company, is familiar to a MASS specialist.

The person is deeply versed in cybersecurity, risk management and understands information technology, artificial intelligence, the internet of things and robotics. The MASS specialist knows how to lead themselves and manage the challenges of human factors and work ergonomics, such as sedentary work. They know how to negotiate in English and have basic knowledge of maritime laws, contracts and insurance.

A MASS specialist is future-oriented, able to perceive scenarios and lead change. They also understand start-ups and entrepreneurship which are emerging in a new business area.

A MASS expert can specialise/continue their studies (later) in the following areas: MASS ship control, MASS, extended security, cyber security, extended MASS law, contracts, insurance, and so on.

5 ONLINE SURVEY

The era of future autonomous shipping should certainly meet the needs of the shipping cluster. The MET for this very demanding shipping requires high-level training. To effectively steer the development of maritime education, a comprehensive online survey was conducted. The survey link was sent to respondents, and this allowed the inclusion of maritime professionals and specialists from different departments, ships, shipping companies, crew members and different regions, and even with various levels of knowledge of intelligent and autonomous shipping. The objective of the survey was to assess seafarers' perceptions, attitudes and concerns related to the implementation and adoption of autonomous ships in the maritime industry.

Maritime specialists were requested to share their point of views on MASS by filling in an online form. The survey was conducted in June 2023. There were fewer than twenty respondents, but their frank views and observations, based on their knowledge and experience, were still valuable in order to get a general picture of expert views.

We used questions with multiple choice response options, scaling questions, rating questions, and space for the opportunity to express opinions, if an appropriate answer was not offered. The questionnaire was created with the help of 15 questions: questions 1–3 help us get to know respondents better, their place of work, work experience and professional position. The next group of questions give us the technology preparedness level and observations of the biggest obstacles for MASS, and the last group of questions help us sort meaningful aspects of seafaring in the programme.

The findings of the study shed light on seafarers' perspectives on MASS. Overall, the results indicate a mixed response from seafarers, with a significant proportion expressing both positive and negative views towards autonomous ships. While some seafarers recognised the potential benefits of MASS, such as improved safety, reduced human error and increased operational efficiency, others expressed concerns about job displacement, reduced skill requirements and potential safety risks associated with relying heavily on automation.

The results of this questionnaire-based study contribute valuable insights to the ongoing discussions and debates surrounding the integration of autonomous ships into the maritime industry. The findings highlight the need to address seafarers' concerns, ensuring proper training and reskilling opportunities, and developing comprehensive regulatory frameworks to ensure a smooth transition to a future with maritime autonomous surface ships.

6 CONTENT OF THE POSTGRADUATE DIPLOMA PROGRAMME

After the literature review, benchmarking both Xamk's current studying programs and what kind of MASS student programs there are available, and after the questionnaire, we present the structure of the programme using the main points of the modules. In Appendix 1 we have presented the degree programme and its code number and course name for the corresponding Xamk course. The structure of the training programme we present is based on the points presented earlier in the article.

The contents of these courses must be tailored to correspond to MASS studies, i.e., their focus must be on autonomous ships. In addition, one or two courses from Xamk's current courses listed under the modules of the training programme should be prepared, from which the duplication of the same subjects will be removed. From the content extracted from Xamk's courses, you must also select the content relevant to MASS and build the actual content of the programme in question from them. The current language of instruction for many of the courses mentioned below is Finnish, which should also be considered when building the courses.

In the preliminary programme framework, possible written end-of-life work and its guidance have not been considered. If written research is desired in the programme, we suggest that the instructions for it be made at the beginning of the programme, and during the programme the participants write the research on the topics of their choice. It would be good for the topics to be related to MASS from different companies.

The curriculum of the programme is presented below.

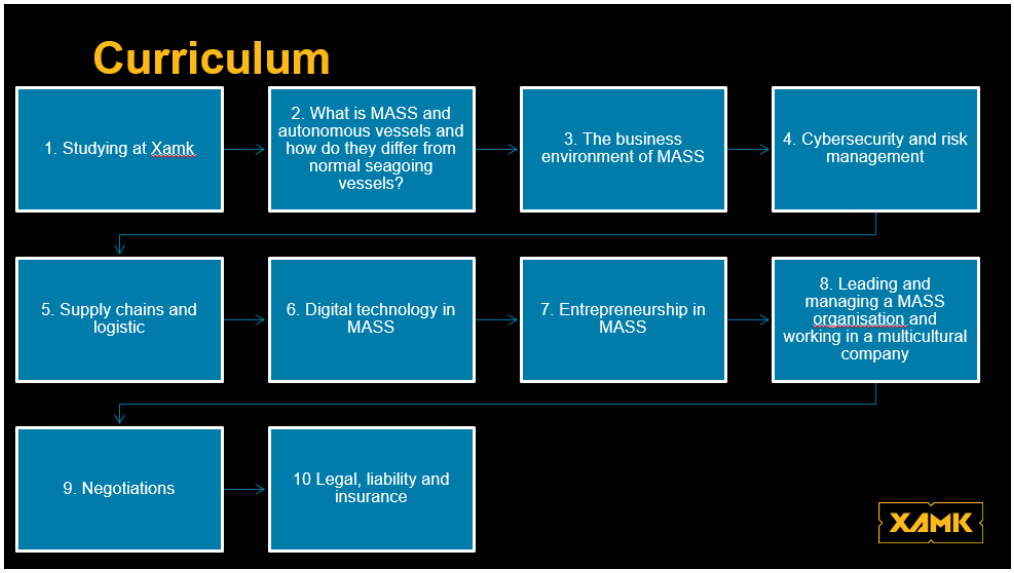

Figure 1: Curriculum of the programme

A prerequisite for participating in the programme is fluency in English. If an applicant is not fluent in English, they can still be accepted onto the programme. In this case, they must also study English on Xamk courses alongside the programme.

1. Studying at Xamk

This course gives the participant knowledge of studying at Xamk and how to use Microsoft Office programmes. Also, the course provides know-how to lead oneself and master the dangers of work ergonomics, such as sedentary work. The topics are the following: being a student at a university of applied sciences, what is XAMK like in terms of a study community and learning environment, what is your personal career and study plan and what kind of a learner are you, and how do you develop your study skills? How do you consider work ergonomics in sitting work? How do you use Office 365 applications such as Word, Excel, PowerPoint, Outlook and Teams?

2. What is MASS and autonomous vessels and how do they differ from normal seagoing vessels?

This course gives the participant knowledge of normal seafaring and how autonomous ships are different. The topics are the following: watchkeeping and seaman skills, ship handling, ship control systems, piloting, and intelligent ships.

3. The business environment of MASS

This course provides the participant with the knowledge of autonomous ships and MASS. The topics are the following: what is MASS, what are the benefits and disadvantages of MASS, how will MASS change maritime jobs and working, what is the future of autonomous ships, and how will MASS change and affect the maritime industry, seafaring economy, new business environment and international business practices?

4. Cybersecurity and risk management
After completing this course, the student will be deeply versed in cybersecurity and risk management. The topics are the following: crowd and crisis management, cybersecurity and information security.

5. Supply chains and logistics
This course gives the participant an understanding of the international maritime transport operating environment and how to analyse it. They will know how companies, ships and ports work. The topics are the following: shipping law and freight operations, supply chain management and logistics services.

6. Digital technology in MASS
This course gives the participant knowledge of autonomous ships' information technology, artificial intelligence, the internet of things, big data, and robotics. The topics are as follows: maritime information technology, AI and future technologies, IoT in business, big data and visualisation, and robotics.

7. Entrepreneurship in MASS
This course gives the participant the knowledge of how to be an entrepreneur in the MASS industry. The topics are the following: entrepreneurship, from idea to business, different business models, business development and growth tools, start-ups, and capital investors.

8. Leading and managing a MASS organisation and working in a multicultural company
This course gives the participant the knowledge of how to master the management of people, things and projects in international and multicultural companies. The course also covers change management. The topics are as follows: leadership skills, strategic management in SMEs, leadership in international business, management, and workplace skills, project and process management, and intercultural competencies.

9. Negotiations
This course gives the participant knowledge of international negotiations in English. The topics are the following: international business negotiations.

10. Legal, liability and insurance
This course gives the participant basic knowledge of maritime laws, contracts, liability and insurance. The topics are the following: maritime labour law, maritime conventions, shipping documents, maritime law and insurance, and business law and IPR.

7 TOPICS TO BE CLARIFIED, INVESTIGATED OR ACTED ON IN THE FUTURE

Based on the findings by writing this article, the following recommendations are proposed to Xamk and the participants of the AutoMare EduNet project.

7.1 Recommendations

At least once a year, a review round related to MASS business should be done, including the latest articles and training programmes.

Together with the maritime industry, the needs of companies and stakeholders related to MASS's business operations must be mapped once a year. The mapping can be done, for example, with a survey or a short Teams seminar, where essential points about the state of MASS business are presented, and at the same time the needs of the participants are mapped.

The criterion of digital content concerning Digivisio 2030 must be followed, and the e-learning material must be built according to this.

If the goal is to start, for example, the MASS education programme proposed in this article at the beginning of next year, a more detailed study programme should be planned as soon as the beginning of autumn. At the same time, the construction of the English language MASS-training program should begin.

8 FINALLY

Finally, we would like to thank all the people who participated in the survey and the members of the AutoMare EduNet project.

As stated earlier, the change has already started in the maritime industry. MASS is not coming – it is already here. It is the responsibility of METs to create sufficient skills for those interested in the field and professionals in the sector to face the future.

From a commercial policy point of view, it is the government's duty to enable METs to succeed in their task, especially when you take into account the possible trade policy struggle between China and the EU.

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Appendix 1/1

The preliminary content of the postgraduate diploma programme

In this appendix, we present the preliminary content of the programme through the main points of the modules and the course number for the corresponding Xamk course.

A prerequisite for participating in the programme is fluency in English. If a person is not fluent in English, they can still be accepted onto the programme. In this case, they must study English on Xamk courses alongside the programme.

The contents of these courses must be tailored to correspond to MASS studies, i.e., their focus must be on autonomous ships. In addition, one or two courses from Xamk's current courses listed under the modules of the training programme should be prepared, from which any course duplication will be removed. From the content extracted from Xamk's courses, participants must also select the content relevant to MASS and build the actual content of the programme in question from them. The current language of instruction for many of the courses mentioned below is Finnish, which should also be considered when building the courses.

In the preliminary programme framework, possible written end-of-life work and its guidance have not been considered. If written research is desired in the programme, we suggest that the instructions for it be made at the beginning of the programme, and during the programme the participants conduct their research on the topics of their choice. It would be good for their desired topics to be related to MASS from different companies.

1. Studying at Xamk

This course gives the participant the knowledge of studying at Xamk and how to use Microsoft Office programmes. Also, the course gives the participant know-how to lead themselves and master the dangers of work ergonomics, such as sedentary work. The topics are the following: Being a student at a university of applied sciences, what XAMK is like in terms of studying community and learning environment, what is your personal career and study plan, and what kind of learner are you and how do you develop your study skills? Work ergonomics. Office 365 like Word, Excel, PowerPoint, Outlook and Teams.

- Being a student at a university of applied sciences
- What is XAMK like in terms of studying community and learning environment?
- What is your personal career and study plan?

- What kind of a learner are you and how do you develop your study skills?
- Xamk's support for studying when the lack of motivation arises
- How do you consider work ergonomics in sitting work?
- How do you use Office 365 applications such as Word, Excel, PowerPoint, Outlook and Teams?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Study Skills (1 cr), Code: MK00DQ59

Content:
Being a student at a university of applied sciences
- What is XAMK like in terms of a studying community and learning environment?
- What is your personal career and study plan?
- What kind of learner are you and how do you develop your study skills?

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Information technology (3 cr) Code: MK00DQ67

Content:
- The students know how to use word processing and spreadsheet programs in the workplace and learn the necessary functions. They will be able to prepare a PowerPoint presentation. They are able to transfer data (embed/link) between MS Office programmes.

2. What is MASS and autonomous vessels and how do they differ from normal seagoing vessels?

This course gives the participant the knowledge of normal seafaring and how autonomous ships are different. The topics are as follows: watchkeeping and seaman skills, ship handling, ship control systems, piloting, and intelligent ships.

- Shipboard terms and definitions
- Watchkeeping procedures and communication
- Navigational aids and signals
- Magnetic and gyrocompasses
- International regulations for preventing collisions at sea
- Responsibilities of a lookout
- Responsibilities of a helmsman
- Alarm and distress systems and signals
- Emergency duties

- Wind and current effect in manoeuvring
- Propulsion and steering systems
- Control systems
- Ship's hull types
- Bridge and equipment integration
- Anchoring and mooring systems
- Ship handling theory
- The influence of wind
- Digitalisation in ship technology
- Remote monitoring and control
- Augmented reality

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Watchkeeping and seaman skills (4 cr), Code: MK00DQ89

Content:
- Shipboard terms and definitions
- Watchkeeping procedures and communication
- Navigational aids and signals
- Magnetic and gyrocompasses
- International regulations for preventing collisions at sea
- Responsibilities of a lookout
- Responsibilities of a helmsman
- Alarm and distress systems and signals
- Emergency duties

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Ship handling 1 (2 cr), Code: MK00DR01

Content:
- Ships' turning circles
- Stopping vessels
- Wind and current effect in manoeuvring
- MOB operations
- Shallow water effect
- Basics of anchoring and mooring

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Ship's control systems (1.5 cr), Code: MK00DR14

Content:
- Propulsion and steering systems
- Control systems
- Ship's hull types
- Bridge and equipment integration
- Steering tests
- Anchoring and mooring systems

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Ship handling 2 (2 cr), Code: MK00DR15

Content:
- Ship handling theory
- The influence of wind
- Current and shallow water and narrow fairways (SQUAT, bank effect, interaction/suction)
- Different steering and propulsion systems
- Manoeuvring tests
- The rate of turn/radius
- Steering in rough weather and ice-covered water and VTS areas

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Piloting (2 cr), Code: MK00DS01

Content:
- Lectures and projects, including excursions related to pilotage
- Pilotage legislation and the pilot as a member of the bridge team
- Planning a pilotage voyage, taking into consideration the resources of the bridge and ship and the importance of effective teamwork
- Project reporting to the cooperating shipping company

Degree: Bachelor of Engineering. Electrical marine engineering, full-time studies: Code: (MSVKT23SP) Intelligent ships (1.5 cr), Code: SV00DV63

Content:
- Digitalisation in ship technology
- Internet of things
- Remote monitoring and control
- Augmented reality

3. The business environment of MASS

This course gives the participant the knowledge of autonomous ships and MASS. The topics are following: What is MASS, what are the benefits and disadvantage of MASS, how will MASS change maritime jobs and working, what is the future of autonomous ships and how the MASS will change and affect to the maritime industry, seafaring economy, new business environment and international business practices?

- Global trade and shipping
- Shipping as a business
- What are the characteristics of the new dynamic business environment?
- How to distinguish between the forces that constitute the new business environment through real company cases
- How to take advantage of networking activities and networked events
- What is globalisation and what are its implications for companies doing business internationally?
- What are the main challenges companies operating internationally face in terms of different political/legal/economic/cultural environments?
- What are the main internationalisation strategies and market entry modes; and how to assess their risks
- What are WTO and EU trade principles and how might they affect import and export businesses?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Seafaring economy (1.5 cr), Code: MK00DR28

Content:
- Global trade and shipping
- Shipping as a business

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital New business environment (5 cr), Code: IB00EC49

Content:
- What are the characteristics of the new dynamic business environment?
- How to utilise information gained from company visits, workshops with local businesses, and business forums?
- How to distinguish between the forces that constitute the new business environment through real company cases
- How to take advantage of networking activities and networked events

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) International business practices (5 cr), Code: IB00EC53

Content:

- What is globalisation and what are its implications for companies doing business internationally?
- What are the main challenges companies operating internationally face in terms of different political/legal/economic/cultural environments
- What are the main internationalisation strategies and market entry modes; and how to assess their risks?
- What are WTO and EU trade principles and how might they affect import and export businesses?

4. Cybersecurity and risk management

After completing this course, the student is deeply versed in cybersecurity and risk management. The topics are as follows: crowd and crisis management, cybersecurity and information security.

- Shipboard emergency plans, instructions and procedures
- Maintaining order and avoiding panic
- Human behaviour and responses in emergency situations
- Effective communication
- Information security generally
- Laws related to information security
- Encryption methods
- What is cybersecurity?
- What is cyber strategy?
- What are security controls and why are they important?
- How to defend against global threats
- How are security policies and risk management related to cybersecurity?
- How are computer networks and cybersecurity related?
- How does a hacker think?
- What tools do hackers use?
- How is cybersecurity present in different areas of business?
- How to defend against global threats

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Crowd and crisis management (A-V/2-1, A-V/2-2) (1.5 cr), Code: MK-00DR98

Content:
- Shipboard emergency plans, instructions and procedures
- Escape routes
- Assisting and searching for passengers in corridors
- Staircases and passageways
- Maintaining order and avoiding panic
- Pre-planning drills
- Optimal resource management
- Leadership skills and stress handling
- Human behaviour and responses in emergency situations
- Effective communication
- Practical shipboard training

Degree: Bachelor of Engineering. Degree Programme in Cyber Security. Cyber security, full-time studies Code (KTKT23SP) Basics of cybersecurity (5 cr), Code: KT00DN42

Content:
- What is cybersecurity?
- How to define cybersecurity
- What is security?
- What is the target of cybersecurity?
- Who is in charge of cybersecurity?
- What is cyber strategy?
- Why is cybersecurity management extremely important?
- What are security controls and why are they important?
- How to defend against global threats
- What is malware?
- How are security policies and risk management related to cybersecurity?
- How are computer networks and cybersecurity related?
- What does a hacker think?
- What tools do hackers use?
- What is penetration testing?
- What are Next Generation Firewalls and where can they be used?
- How to implement basic security policies with firewalls
- How is cybersecurity present in different areas of business?

Degree: Bachelor of Engineering. Degree Programme in Cyber Security. Cyber security, full-time studies Code (KTKT23SP) Information security (5 cr), Code: TI00BI12

Content:
- Basic concepts of information security
- Information security risks, their effects, and rejection.
- Information security generally
- Laws that are related to information security
- Information security standards and certificates
- Encryption methods

Degree: Bachelor of Engineering. Degree Programme in Cyber Security. Cyber security, full-time studies Code (KTKT23SP) Cybersecurity (5 cr), Code: TI00BI23

Content:
- What is cybersecurity?
- What is the role of cybersecurity in different sectors of industries?
- How to defend against global threats

5. Supply chains and logistics

This course gives the participant an understanding of the international maritime transport operating environment and how to analyse it. They know how companies, ships and ports work. The topics are as follows: shipping law and freight operations, supply chain management and logistics services.

- Carriers' responsibilities
- Chartering terms and documents
- Ports and operators
- Ship–shore interface
- Ports, operators and other stakeholders
- Master's role in decision-making concerning carriers' liability in carriage of goods
- What are the features of logistics services?
- How do you plan and productise new logistics services?
- What is the LSP business and business environment?
- How should the principles of sustainability be taken into account in an LSP business?
- What is the role of LSP in demand-supply chains?
- How do you implement quality and environmental impact control systems in LSP?
- What are the special features in developing logistics services?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Shipping law and freight operations (3 cr), Code: MK00DR19

Content:
- Carriers' responsibilities
- Chartering terms and documents
- Ports and operators
- Ship–shore interface
- Ports, operators and other stakeholders
- Master's role in decision-making concerning carriers' liability in the carriage of goods

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) Supply chain management (5 cr), Code: LT00AB01

Content:
- What is the structure of a supply chain?
- How does the supply chain affect the profitability of a company?
- What is the significance of logistical decisions for a company?
- How does ERP help in controlling the supply chain? What basic functions and reports are there in an ERP system? (Kouvola campus)

Degree: Bachelor of Business Administration. Double Degree in Business Logistics: Code: (LLKT23SD). Logistics services (5 cr), Code: LL00CP58

Content:
- What are the features of logistics services?
- How do you plan and productise new logistics services?
- What is an LSP's business and business environment?
- How should the principles of sustainability be taken into account in an LSP business?
- What is the role of LSP in demand-supply chains?
- How do you implement quality and environmental impact control systems in an LSP?
- What are the special features of developing logistics services?

6. Digital technology in MASS

This course gives the participant the knowledge of autonomous ships' information technology, artificial intelligence, the internet of things, big data and robotics. The topics are the following: maritime information technology, AI and future technologies, IoT in business, big data, visualisation and robotics.

- Ship maintenance and management software
- Staff management, work hours and payroll software, or other software commonly used on board
- What are the concepts of AI and future technologies?
- What are the main principles of the business models on AI-powered platforms?
- How to solve business-related tasks in AI-dominated industries
- What are the principles of emerging technologies?
- What are the types of technological trajectories and technological innovations?
- How to identify, analyse and develop smart technologies in business
- What opportunities does the internet of things (IoT) provide for business?
- What are strategies of the global network economy?
- What kind of risks are there in laws related to global business?
- What are the challenges of supply chain management in digital business?
- How do the internet and IoT work technically?
- What is big data?
- What is data analytics?
- How to visualise essential findings in effective ways
- What is robotics security?
- What types of robots exist
- How are robots controlled?
- What applications are used in robotics?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Maritime information technology (1.5 cr), Code: MK00DQ62

Content:

- Ship maintenance and management software
- Staff management, work hours and payroll software, or other software commonly used on board

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) AI and future technologies (5 cr), Code: IB00EC57

Content:
- What are the concepts of AI and future technologies?
- What are the main principles of the business models on AI-powered platforms?
- How to solve business-related tasks in AI-dominated industries
- What are the principles of emerging technologies?
- What are the types of technological trajectories and technological innovations?
- How to identify, analyse and develop smart technologies in business

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) IoT in business (5 cr), Code: LT00DT66

Content:
- What opportunities does the internet of things (IoT) provide for business?
- What are the strategies of the global network economy?
- What kinds of risks are there in laws related to global business?
- What are the challenges of supply chain management in digital business?
- How do the internet and IoT work technically?
- What are the goals of information security and what measures are required to achieve these goals on the Internet?

Degree Programme in Information Technology. Bachelor of Engineering. Information technology, full-time studies Code (ITMI23SP) Big data and visualization (5 cr), Code: IT00EC06

Content:
- What is big data?
- What is data analytics?
- How to visualise essential findings in effective ways

Degree: Bachelor of Engineering. Logistics, part-time studies: Code: (LOKT23SM) Robotics (5 cr), Code: LO00EB62

Content:
- What is robotics security?
- What types of robots exist?
- How are robots controlled?
- What applications are used in robotics?

7. Entrepreneurship in MASS

This course gives the participant the knowledge of how to be entrepreneur in the MASS industry. The topics are as follows: entrepreneurship, from idea to business, different business models, business development and growth tools, start-ups and capital investors.

- What opportunities does digital society offer for entrepreneurship?
- What are the operational processes of enterprises?
- What are the main stakeholder groups?
- What aspects must be considered when deciding the form of businesses?
- What are the support networks of a start-up company?
- How are company finances planned and managed?
- How is a business managed in practice?
- How are products/services marketed and sold?
- How to analyse the industry and the market environment for business development
- How do external and internal factors affect business development and growth opportunities?
- What is a high-growth business and what are growth strategies?
- What means and methods are used to develop business?

Corresponding Xamk courses:

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) Business, and entrepreneurship (5 cr), Code: LT00AA91

Content:

- What opportunities does digital society offer for entrepreneurship?
- What is the role of entrepreneurship in society?
- What are the operational processes of enterprises?
- What are the main stakeholder groups?
- What aspects must be considered when deciding the form of business?
- What are the key interest groups?

Degree: Bachelor of Business Administration. Business management, part-time studies. Code: (LTMI23SM) From idea to business (10 cr), Code: LT00EB05

Content:
- What issues are associated with early-stage business ideation, establishment process and operation planning?
- What are the support networks of a start-up company?
- How are company finances planned and managed?
- How can you assess and develop your own knowledge?
- How is a business managed in practice?
- How are products/services marketed and sold?

Degree: Bachelor of Business Administration. Business management, part-time studies. Code: (LTMI23SM) Business development and growth tools (5 cr), Code: LT00EL68

Content:
- How to analyse the industry and the market environment for business development
- How do external and internal factors affect business development and growth opportunities?
- What is a high-growth business and what are growth strategies?
- What means and methods are used to develop business?

8. Leading and managing MASS organisation and working in a multicultural company

This course gives the participant the knowledge of mastering the management of people, things, and projects in an international and multicultural company. The course also covers change management. The topics are the following: leadership skills, strategic management in SMEs, leadership in international business, management and workplace skills, project and process management, and intercultural competences.

- Company and ship as an organisation
- Managing things and people
- What are the core competencies of leadership in international business?
- What kinds of situational demands are there for leadership in international business?
- How do you develop work community collaboration in a goal-oriented way?
- How do you act as a leader and supervisor in changing working life environments?
- Strategic, tactical and operational management
- Business strategy
- How to create effective strategic management policies and action plans
- How can the strategy be integrated/implemented into the activities of an SME?

- How do you lead yourself?
- How do you act as a leader and supervisor in changing working life environments?
- How to communicate effectively in intercultural settings
- What are the key project management methods?
- What are the challenges of project management?
- What are the principles, advantages and limitations of project management software?
- What are the key principles of process management?
- What are the opportunities and challenges of process management?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Leadership skills (2 cr), Code: MK00DR24

Content:

- Company and ship as an organisation
- Management systems
- Managing things and people
- Strategic, tactical and operational management
- Managing business
- Risks
- Leadership

Degree: Bachelor of Business Administration. Business management, part-time studies. Code: (LTMI23SM) Strategic management in SMEs (5 cr), Code: LT00EL67

Content:
- How to define a mission, vision and values
- What does foresight mean as part of strategy work?
- How are strategic objectives defined?
- How to create effective strategic management policies and action plans
- How can the strategy be integrated/implemented into the activities of an SME?
- How is the effectiveness of processes assessed and measured?
- How are results monitored?

Degree: Bachelor of Engineering. Logistics, part-time studies: Code: (LOKT23SM) Leadership in international business (5 cr), Code: LO00EB68

Content:
- What are the core competencies of leadership in international business?
- How can you manage team motivation and dynamics?
- What kind of situational demands are there for leadership in international business?

Degree: Bachelor of Engineering. Logistics, part-time studies: Code: (LOKT23SM) Management and workplace skills (5 cr), Code: KY00DS62

Content:
- How do you lead yourself?
- How do you identify various roles, behaviour patterns and phenomena in work communities?
- How do you communicate and act as a responsible member of a work community and lead it?
- How do you apply leadership models in various types of organisations?
- How do you develop work-community collaboration in a goal-oriented way?
- How do you act as a leader and supervisor in changing working life environments?

Degree: Bachelor of Engineering. Logistics, part-time studies: Code: (LOKT23SM) Project and process management (5 cr), Code: LO00EB54

Content:
- What are the key project management methods?
- What are the challenges of project management?
- What are the principles, advantages and limitations of project management software?
- What are the key principles of process management?
- What are the opportunities and challenges of process management?

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) Intercultural competencies (5 cr), Code: IB00EC47

Content:
- What is culture?
- What are values, beliefs and (negative) cultural perceptions?
- How to recognise cultural differences based on comparing elements of your own national culture to other cultures
- How to communicate effectively in intercultural settings

9. Negotiations

This course gives the participant the knowledge of international negotiations in English. The topics are the following: international business negotiations.

- What are the main theoretical principles and practical steps of the negotiation process?
- How to select the right strategies and tactics in international business negotiation situations
- How to boost your negotiating skills through practical negotiation simulation exercises
- What kind of aspects should you take into account when making international b2b sales contracts?

Corresponding Xamk courses:

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) International business negotiations (5 cr), Code: IB00EC51

Content:

- What are the main theoretical principles and practical steps of the negotiation process?
- How to select the right strategies and tactics in international business negotiation situations
- How to boost your negotiating skills through practical negotiation simulation exercises
- What kinds of aspects should you take into account when making international b2b sales contracts?

10. Legal, liability and insurance

This course gives the participant the basic knowledge of maritime laws, contracts, liability and insurance. The topics are the following: maritime labour law, maritime conventions, shipping documents, maritime law and insurances, and business law and IPR.

- Basics of maritime legislation
- Masters' and seafarer's responsibilities
- Owner's responsibility
- Terms of marine insurance
- Basics of risk management
- Insurance business and coverage
- Masters' role in maritime and transport casualties
- Essential organisations of seafaring
- Fundamentals of national and international maritime regulation
- IMO

- Conventions, SOLAS, STCW, LL, COLREG, MLC, SAR, Port State Control
- Content of a bill and a charter of landing
- Shipping and insurance documents used in seaborne trade
- International b2b sales
- How can a business protect its rights?
- How is the appearance of products, industrial inventions, computer programs, music, photos, texts and know-how protected and how is exclusive right to their use acquired?

Corresponding Xamk courses:

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Maritime labour law (1.5 cr), Code: MK00DQ60

Content:
- Contracts of Employment Act for Seafarers
- Contract of employment
- Collective agreement
- Working Hours Act for seafarers
- Wage security
- Seaman's taxation and pension fund
- Occupational safety legislation
- Occupational safety-related issues of seafaring
- Essential organisations of seafaring

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Maritime conventions (1 cr), Code: MK00DR10

Content:
- Fundamentals of national and international maritime regulation
- IMO
- Conventions, SOLAS, STCW, LL, COLREG, MLC, SAR, Port State Control

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Shipping documents (2 cr), Code: MK00DR20

Content:
- Are you able to explain the content of a bill of lading and do you understand the related terms and conditions written in English?
- Are you able to explain the content of a charter party and do you understand the related terms and conditions written in English?
- Are you aware of other shipping and insurance documents used in seaborne trade?

Degree: Bachelor of Engineering. Bachelor of Marine Technology. Master mariner, full-time studies Code (MKKT23SP) Maritime law and insurances (2 cr), Code: MK00DR22

Content:
- Basics of maritime legislation
- Maritime law, criminal law, labour law
- Masters' and seafarer's responsibilities
- Owners' responsibility
- Terms of marine insurance
- Basics of risk management
- Insurance business and coverage
- Masters' role in maritime and transport casualties

Degree: Bachelor of Business Administration. Degree Programme in Digital International Business. Digital International Business, full-time studies Code (IBKV23SP) Business Law and IPR (5 cr), Code: IB00EP98

Content:
- How is a binding sales contract made and under what conditions will a contract be invalid?
- What are the rights and obligations of the seller and buyer in the sale of tangible goods?
- How do b2b sales and consumer sales differ?
- How can a business protect its rights?
- How should intellectual property rights be taken into account in marketing?
- How is the appearance of products, industrial inventions, computer programs, music, photos, texts and know-how protected and how is the exclusive right to their use acquired?

COURSE REFERENCES

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