



Sveučilište u Rijeci, Pomorski fakultet
University of Rijeka, Faculty of Maritime Studies

CURRICULUM AND STUDY PROGRAM

Marine Engineering

UNDERGRADUATE DEGREE PROGRAMME

Marine Engineering and Maritime Transport Technology

GRADUATE DEGREE PROGRAMME



UNIVERSITY OF RIJEKA

Faculty of Maritime Studies, Rijeka

**Undergraduate degree program
MARINE ENGINEERING**

**Graduate degree program
MARINE ENGINEERING AND
MARITIME TRANSPORT
TECHNOLOGY**

1. INTRODUCTION

The fundamental goal of systematic education of maritime personnel is to ensure the application of knowledge, development of skills, and maintenance of competencies related to modern techniques, technology and emerging requirements primarily within the maritime economy, but also beyond. This aims to enhance management, support maintenance efforts and promote the intensive development of the maritime sector as a whole. The education system will strengthen individual capabilities and improve the institutional structure to effectively meet the challenges of maritime economic development in the Republic of Croatia and globally. Croatian seafarers are in high demand and highly regarded, and there is a significant shortage of marine engineers in the merchant navy.

The main goals and objectives of the undergraduate degree program in Marine Engineering and the graduate degree program in Marine Engineering and Maritime Transport Technology are:

- To provide full-time education for the highest officer ranks (Second Engineer on ships with a propulsion power of 3000 kW or more and Chief Engineer on ships with a propulsion power of 3000 kW or more) for Croatian shipowners and the global market,
- To promote a culture of safety at sea and marine environmental protection through continuous education and training of seafarers,
- To apply a scientific approach to the revitalization of the Croatian maritime economy,
- To continuously improve the quality of higher education for maritime professionals in accordance with global and EU standards, as well as the Bologna Declaration,
- To support lifelong learning in accordance with the principles of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers – STCW 1978/95 Convention, ensuring global comparability of study programs and the mobility of teachers and students, including retraining programs aligned with the EU project “METNET”.

Key features of the program include:

- harmonization and compatibility of study curricula,
- international recognition and equivalence of diplomas and academic titles,
- the unique nature marine officers worldwide, characterized by a strong integration of scientific and professional work.

1.1. Rationale for launching the study program

Purpose of the study program

From the perspective of labor market demands in both the public and private sectors, the launch of the new study program responds to the continuous need expressed by shipowners for qualified personnel. These professionals must be capable of maintaining propulsion systems and managing modern ships as complex technical and technological systems. They are also expected to possess a detailed understanding of maritime business from the standpoint of shipowners, as well as also other entities within the maritime sector.

The study program is applicable across various economic branches and scientific fields, providing a foundation for the successful operation of maritime companies and competent

public and governmental institutions. Upon completion, students acquire knowledge and skills that enable them to secure employment, primarily in institutions and companies involved in maritime affairs, but also in transportation and economic sectors responsible for managing and executing of the transport process. Although the focus is on maritime transport, the acquired competencies are not limited to this field.

Link to contemporary scientific knowledge

All study programs are firmly rooted in modern scientific knowledge within the broader field of technical sciences, particularly in traffic and transport technology, and most notably in maritime industry. The necessary knowledge and skills are based on up-to-date scientific insights. Course content is regularly updated to reflect technological advancements in systems under the responsibility of marine engineer officers.

Comparability with programs at reputable international higher education institutions

During the development of the program, special attention was given to aligning its structure and course content with those of reputable foreign educational institutions, ensuring international comparability.

The consideration of the comparability of the curriculum and programs of the undergraduate degree study of marine engineering and the graduate degree study of marine engineering and maritime transport technology with related studies and higher education institutions in the world requires additional explanation.

The education systems for maritime professionals vary significantly across countries. There is no uniform global standard. Differences exist in almost all components of education: entry requirements, the objectives and outcomes of education, types and structures of programs, the duration of studies, professional titles and diplomas acquired at individual institutions, the names of higher education institutions, etc. Despite these differences, a detailed analysis of similar programs, particularly within the European Union, has revealed a high degree of comparability between this study program and those offered by the following international institutions:

- World Maritime University (International Maritime Organization – IMO), Malmo, Sweden
- Facultat de Nautica de Barcelona, Spain
- Vestfold College of Maritime Studies, Norway (Nautical Studies)
- Massachusetts Maritime Academy, USA (Marine Transportation)
- Cork Institute of Technology, Ireland (Engineering in Marine Engineering)

1.2. Experience in implementing equivalent or similar programs

Previously, maritime education was organized through two-year and four-year study programs. These were restructured under earlier reforms into a three-year undergraduate degree program, followed by a two-year graduate degree program. It is important to highlight that the original version of the undergraduate program included all the content required by the STCW Convention within the first two years. Upon completion of the second year, and with appropriate certification, students were eligible to take professional examinations administered by the Port Authority and could subsequently attain the highest rank of engineer officer on board – Chief Engineer. Subsequent changes redistributed the STCW-related courses across all three years of the undergraduate degree program.

The new undergraduate degree program in Marine Engineering aims to maintain this high

standard of professional knowledge while expanding the curriculum to include emerging techniques and technologies increasingly implemented on ships. These developments are driven largely by efforts to reduce the harmful environmental impact of maritime operations and the growing adoption of electric propulsion systems. The graduate degree program in Marine Engineering and Maritime Transport Technology succeeds the former four-year study program offered by the Department of Marine Engineering at the Faculty of Maritime Studies in Rijeka. In the original four-year program, the STCW-mandated content was covered during the first two years, while the final two years served as an advanced track designed to prepare students for land-based maritime professions. The newly adopted graduate degree program introduces some innovations to meet the evolving needs of engineer officers. These include expanded coursework on electric motor propulsion systems and enhanced content related to project development and management, with the goal of improving employability in engineering and project-based roles. Additionally, by revising the elective and compulsory course structure, the program encourages students to acquire practical and career-relevant knowledge.

It is important to emphasize that both the new undergraduate and graduate degree programs have been developed in accordance with the Bologna Declaration, aligned with contemporary global trends and grounded in the latest scientific findings. Drawing on lessons learned from previous implementations, the program has been modernized both in organizational terms and in its overall academic approach.

1.3. Potential partners outside the higher education system

The graduate degree program is designed to prepare students for employment and professional advancement both within the core maritime sector and in a wide range of maritime and transport-related institutions and companies whose operations are closely related to maritime affairs.

Accordingly, stakeholders outside the higher education system who are or may be interested in this program include institutions and companies such as harbormasters' offices, the Ministry of the Sea, Transport and Infrastructure and other relevant ministries, port authorities, ports, terminals, marinas, shipowners, shipyards, repair companies, heating plants, the oil industry, transport companies, ship registries, schools, and other educational institutions.

It is important to note that the Faculty of Maritime Studies in Rijeka has already established strong partnership with many of these entities. Business and technical cooperation agreements have been signed with a number of organizations, and further agreements are planned to continue strengthening these ties.

Notable institutions and companies with which the Faculty collaborates include the following: the Ministry of the Sea, Transport and Infrastructure and other government ministries, State Port Authorities (Rijeka, Pula, Senj, Zadar, Šibenik, Split, Ploče and Dubrovnik), county port authorities and companies that manage port operations (Port of Rijeka, Port of Pula, Port of Zadar, Port of Šibenik, Port of Split, Port of Ploče and Port of Dubrovnik), shipping companies (Jadrolinija Rijeka, Lošinjska plovidba Rijeka, Tankerska plovidba Zadar), shipyards (3. Maj Rijeka, Kraljevica, ...) and others.

1.4. Openness of the program towards student mobility

Comparisons with similar study programs offered at the aforementioned universities, maritime faculties and other higher education institutions around the world, with which the Faculty of Maritime Studies of the University of Rijeka has established various forms of cooperation,

serve as a strong foundation for achieving the core objectives of the Bologna Declaration: compatibility of study programs and promotion of student and faculty mobility.

These programs facilitate academic mobility both within the Faculty of Maritime Studies of the University of Rijeka and beyond. Students can transfer between related study programs offered by other faculties within the University of Rijeka (Faculty of Engineering, Faculty of Economics, Faculty of Law, Faculty of Tourism and Hospitality Management) or to programs offered by other Croatian universities (Faculty of Maritime Studies of the University of Split, Maritime Department of the University of Dubrovnik, University of Zadar, Faculty of Transport and Traffic Sciences of the University of Zagreb, etc.) and study programs of recognized world higher education institutions, especially those in the European Union.

1.5. Other elements and required information

It is important to emphasize that the undergraduate degree program in Marine Engineering and the graduate degree program of Marine Engineering and Maritime Transport Technology are unique in that, in addition to meeting the general principles of university education, they must also fulfill specific requirements. Notably, these include alignment with international standards, a distinctly multidisciplinary character, and the integration of scientific knowledge with professional practice.

The alignment primarily refers to mandatory compliance with international standards set by the International Maritime Organization (IMO) based in London.

The programs are required to adhere to the STCW Convention 78/95 (Standards of Training, Certification and Watchkeeping for Seafarers), as well as, indirectly, to other IMO Conventions such as SOLAS 74/78 (International Convention for the Safety of Life at Sea), MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships), and others. All of these conventions have been ratified by the Republic of Croatia and are therefore legally binding.

Based on the requirements of the STCW Convention 78/95, the Regulation on titles and certificates of competency of seafarers on merchant marine ships of the Republic of Croatia was adopted and came into force in 1998.

Another important feature of the study programs is their alignment with maritime education models of the world's most developed maritime nations (particularly those of the European Union, followed by the USA, Japan and Australia) through the adoption of MET (Maritime Education and Training) standards. This alignment is also a significant requirement.

Considering all the above, the proposed undergraduate degree program must, in addition to receiving approval from the Ministry of Science, Education and Youth, also meet the requirements and obtain verification from the Ministry of the Sea, Transport and Infrastructure. The following requirements must be fulfilled:

- compatibility of study programs with the provisions of the STCW Convention 78/95 and the Regulation on titles and certificates of competency of seafarers on merchant marine ships of the Republic of Croatia
- teaching staff responsible for specialized courses must possess appropriate maritime certifications in accordance with the STCW Convention 78/95
- the institution must meet strict requirements regarding facilities, appropriate equipment and other teaching resources (particularly important are modern ship engine room simulators, refrigeration equipment, computer-based engine simulator, computer-based cargo loading

simulator, computer-based steam plant simulator, as well as appropriate literature, training grounds and safety at sea practicum and access to a training ship)

- the institution must hold an ISO certificate for an international quality standard recognized by the Ministry of the Sea, Transport and Infrastructure.

The Faculty of Maritime Studies of the University of Rijeka has previously offered a marine engineering degree program that complied with these requirements. The newly proposed program, while modernised, continues to uphold the same foundational principles. It includes all necessary content in accordance with the STCW Convention 78/95.

Students who complete the undergraduate degree program in Marine Engineering, having successfully passed courses that include the mandatory content required by the STCW Convention 78/95 and aligned with the Regulations on titles and certificates of competency of seafarers on merchant marine ships of the Republic of Croatia, are eligible to complete their seagoing practice and sit for the certification exams for the highest professional ranks (Second Engineer on ships with propulsion power of 3000 kW or more and Chief Engineer on ships with propulsion power of 3000 kW or more).

Upon completion of the undergraduate degree program in Marine Engineering, students are awarded a certificate and the academic title of Bachelor of Science in Marine Engineering. Upon completing the graduate degree program in Marine Engineering and Maritime Transport Technology, they are awarded a certificate and the academic title of Master of Science in Marine Engineering and Maritime Technology.

2. GENERAL SECTION

2.1. Study program title

Title of the undergraduate degree program: **Marine Engineering**

Title of the graduate degree program: **Marine Engineering and Maritime Transport Technology**

2.2. Study program holder and provider

Study program holder and provider is the University of Rijeka Faculty of Maritime Studies.

2.3. Duration of the study program

The undergraduate degree program lasts 3 years, or 6 semesters, and comprises a minimum of 180 ECTS credits.

The graduate degree program lasts 2 years, or 4 semesters, and comprises a minimum of 120 ECTS credits.

Teaching is conducted over six semesters for the undergraduate program and ten semesters in total for students who continue to the graduate level. The forms of instruction include lectures, seminars, exercises, workshops, individual consultations, mentoring, professional training on simulators, maritime training grounds and ships, as well as case studies based on practical experience and relevant literature.

2.4. Enrollment requirements

Enrollment in the first year of study is conducted through a public call for applications or by transfer from another related higher education institution. Progression to the next year of study is based on the fulfilment of academic requirements as defined by the study program regulations.

Applicants who have completed at least four years of secondary education and have submitted a complete and timely application for the admission competition are eligible to apply.

In accordance with Article 77 of the Act on Scientific Activity and Higher Education, any individual who meets the prescribed requirements has the right to enroll, subject to the enrollment capacity of the Faculty. If the number of qualified applicants exceeds the available capacity, priority will be given to candidates who achieve the highest scores in the selection process.

2.5. Undergraduate degree program

The study program is designed to equip students with the knowledge and skills required for maintenance and operational management on ships, specifically for performing the duties of ship engineer officers at both the operational and management levels. Graduates of the graduate degree program are qualified to assume senior positions within shipping companies, shipyards, design offices, and related sectors.

The curriculum covers a broad range of disciplines, including engineering, technology, electrical engineering, maintenance, IT, environmental protection, marine engineering, economics, law, and management. This multidisciplinary foundation enables graduates not only to pursue careers in maritime and transport sectors closely linked to shipping, but also to find employment in a variety of institutions and companies requiring technical and managerial expertise. Thanks to the comprehensive and multidisciplinary structure of both the undergraduate and graduate degree programs, students are also well-prepared to take on roles

such as maintenance service managers in large systems (hospitals, hotels, municipal services, etc.).

The undergraduate program includes all mandatory content required by the STCW Convention 78/95 for obtaining the highest maritime qualifications (Second Engineer on ships with a propulsion power of 3,000 kW or more and Chief Engineer on ships with a propulsion power of 3,000 kW or more). Courses are generally structured as one-semester modules, with flexibility to accommodate evolving content and to support student participation in mobility programs and student exchange opportunities with other universities at any stage of their studies.

Table 2.1. Learning outcomes at the level of the study program for the current academic year
Marine Engineering, undergraduate degree study

A set of learning outcomes for the study prog.	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10
Course	FUND. PROF. COURSES	CONSTR. AND OPERATIONAL FEATURES OF THE SHIP	PLANT AND CREW MANAG.	TECHNICAL SUPERV. AND LEGAL REGUL.	MARINE PROPUL. ENGINES	MARINE AUX. SYS. AND DEVICES.	MARINE ELECT. ENGINEERING, ELECTRONICS AND AUTOM.	SAFETY AT SEA AND THE PROT. OF THE ENVIR.	PLANT MAINT.	BSc THESIS
ML				+				+		
EL 1	+									+
Math1	+									+
TM 1	+									+
ACS	+									+
TMP	+								+	
SE							+			
Mar.Eng. Comp.	+									
PE 1			+					+		
EL 2	+	+			+					+
Math 2	+									+
TM 2	+									+
MTS		+		+						
MEMD							+	+	+	+
THT	+				+	+				+
SPA			+	+	+	+	+	+	+	
PE 2			+							
EL 3	+				+					+
FLW	+		+		+	+			+	+
MCCM			+						+	+
M.Eng.			+	+	+		+	+	+	+
MSG			+	+	+	+	+	+	+	+
MAEE			+	+		+	+	+	+	+
MHT			+	+	+	+	+	+	+	+
EL 4	+					+				+
SMEP			+	+		+		+		+
SAS			+			+		+	+	+
FD			+	+	+	+	+		+	+
MPS			+	+	+	+	+	+	+	+
TSSC		+		+	+	+		+		
MM		+			+	+	+		+	+
MEPS					+		+		+	+
Sim. 1			+		+	+	+	+	+	+
MHP			+			+	+		+	+
Sim. 2			+		+	+	+	+	+	+
On-b. training		+	+		+	+	+	+	+	

LCTT		+				+		+	+	
BSc thes										+
Mar. med.			+					+		
SOC			+		+	+	+		+	
EL 5			+	+						+
MAC			+		+	+	+			
Meh. & vib.		+			+	+				
SED									+	+

MS					+	+	+	+	
CMP			+		+		+	+	
Onb. training		+							
EL 6			+	+					

Table 2.1.a Set of learning outcomes – legend
Undergraduate university degree study in Marine Engineering

Label SLO	Description of sets of learning outcomes
IUB1P	FUNDAMENTAL PROFESSIONAL COURSES - Apply mathematical laws to solve problems. Be familiar with the basic laws of mechanics and thermodynamics and apply them using computers. Use English in communication. Be familiar with engineering materials, processing of materials and be able to dimension machine elements.
IUB2P	CONSTRUCTION AND OPERATIONAL FEATURES OF THE SHIP - Explain the principles and international regulations regarding ship construction. Explain the main measures and dimensions as well as different types of ship. Describe structural and propulsion elements. Explain the stability of the ship and explain the different impacts on the stability.
IUB3P	PLANT AND CREW MANAGEMENT - Manage the plant, including electrical and electronic systems, monitor and regulate parameters in navigation and rectify faults, apply safety measures and occupational safety, manage work in the engine room.
IUB4P	TECHNICAL SUPERVISION AND LEGAL REGULATIONS - Explain basic legal regulations. Be familiar with inspections and certificate. Be familiar with the procedures of inspection, the methods of execution and the requirements of safety at work. Make a report on carried out inspection work.
IUB5P	MARINE PROPULSION ENGINES - Explain theoretical processes, structure, exploitation, auxiliary systems, perform diagnostics, use automated systems, be familiar with the economics of maintenance of engines, turbines and steam generators, be familiar with engineering materials, how they are processed and protected.
IUB6P	MARINE AUXILIARY SYSTEMS AND DEVICES - Explain the types, divisions and principles of operation, characteristics of all auxiliary devices, including information and communication systems. Dimension some basic elements of ship systems. Use remote control.
IUB7P	MARINE ELECTRICAL ENGINEERING, ELECTRONICS AND AUTOMATION - Explain components, principles and operating characteristics of marine electrical system, electrical and electronic devices, DC and AC circuits, automated monitoring, regulation and alert systems.
IUB8P	SAFETY AT SEA AND THE PROTECTION OF THE ENVIRONMENT- Explain safety drills, 'emergency schedules' and a rescue plan. Explain the safety aspects of ship building. Explain environmental concepts, pollution reports, conventions and prevention measures and records thereof.

IUB9P	PLANT MAINTENANCE - Explain the concepts of damage and failure and the fault distribution function, maintenance costs. Explain the reliability of technical systems. Describe strategies for the maintenance of engines and devices, ship's hull and the importance of spare parts.
IUB10P	B.Sc. THESIS - Apply theoretical and practical knowledge acquired during the study when working independently on current topics.

2.6. Graduate degree program

The study program is conceived as a continuation of the undergraduate curriculum, aiming to further develop students' competencies for performing advanced management and maintenance tasks related to ship systems. It also prepares them for successful careers in various maritime and transport institutions and companies whose operations are closely related to maritime affairs.

Courses are organized as one-semester modules, with the flexibility for dynamic update of the course content. This structure supports student participation in mobility programs and student exchange opportunities with other universities at any stage of their studies.

The curriculum encompasses knowledge in the fields of engineering, technology, economics, law and management. Additionally, the study program offers opportunities for specialization in areas such as technical sciences, environmental protection and marine ecology, maritime management and technological systems in transport.

Table 2.1. Learning outcomes at the level of the study program for the current academic year
Marine Engineering and Maritime Transport Technology (108) graduate university degree program

A set of learning outcomes of the st. prog.	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8
Course	Modelling and simulations	Physics processes	Design.	Business sys. manag.	Optimiz. marine processes	Advanced dignost.	Introduc. of new technol.	M.Sc. thesis
Sc. Res. Meth.	+				+			+
Num. Me. in Eng.	+		+	+	+		+	+
Appl. TET		+	+		+		+	+
Appl. Math.	+		+	+	+		+	+
Maint. Sys.				+				
Ecol. in MT						+		
Proj. task 1	+		+		+			+
Weld. and mat. testing		+					+	
ANME	+	+					+	
Mar.Proc.Sys.		+	+		+	+	+	+
PS Sys.		+	+		+	+	+	+
Proj. task 2	+		+		+			+
En. Appl. in Ship		+	+		+	+	+	
MSc thesis	+	+	+		+	+	+	+
Proj. Man.			+	+	+			
Ref. Cont. Sys.			+		+	+	+	
Int.Mar.Saf.Sys.			+				+	
Teh. Sys. Con.			+	+	+		+	

Mod. & sim.	+			+	+		+	+
AWC	+				+	+	+	
Sh. Pow. Trans.			+		+	+		
Cog. Plants			+		+	+	+	
Risk Man in Ship.	+				+			
Mar. Lab. Law				+				
Sh. Prop. Optim.	+			+	+			
Adv. Mar. Proc. Diag.			+			+	+	
Int. Ship. Bus.			+	+				
Int. Tr. Sys.			+	+			+	
DEP					+	+		+

Table 2.1.a Set of learning outcomes – legend

Graduate university degree program of Marine Engineering and Maritime Transport Technology

Label SIU	
IU1D	MODELING AND SIMULATIONS - Know and use mathematical models of physics processes in marine machinery and devices and numerically solve them. Apply solutions in shipping company projects. Apply acquired knowledge in order to optimize the processes.
IU2D	PHYSICS PROCESSES - Knowledge of the most important physical processes in marine machinery and devices and understand their impact on operation. Manage the machinery in a safe and efficient way. Use simulations in designing or diagnosing faults.
IU3D	DESIGN - Apply the acquired knowledge in applied thermodynamics and other physics processes, as well as in applied mathematics and modeling in the design of ship processes, systems, machines and devices, as well as maintenance procedures.
IU4D	BUSINESS SYSTEMS MANAGEMENT - Apply the acquired knowledge in applied mathematics and others, in defining the management system of the ship or the company or part thereof. Be familiar with and use the information systems for managing ship maintenance.
IU5D	OPTIMIZING MARINE PROCESSES - Apply knowledge in optimization of ship processes during design stages. Analyze the possibilities of optimizing with regard to cost reductions and the installation of environmentally friendly technology. Running a ship or line in an efficient way.
IU6D	ADVANCED DIAGNOSTICS - Be familiar with the technological processes on board ship and the effects of failures on processes. Identify essential and non-essential failures and act accordingly. Know new methods of measurement, i.e. monitoring the operation of marine machinery and devices.
IU7D	INTRODUCTION OF NEW TECHNOLOGIES - Be familiar with new methods of energy conversion and their possible applications on board. Analyze technological solutions, advantage/disadvantages Be familiar with the impact of applied energy solutions to the emission of harmful substances into the marine environment.
IU8D	M.Sc. THESIS - Apply theoretical and practical knowledge acquired during the study when working independently on current topics.

2.7. Launching study programs in which the undergraduate and graduate components are combined into one

The undergraduate and graduate degree programs are structured separately, following a three + two year model. That is, the undergraduate program lasts three years, followed by a two-year graduate study program.

2.8. Professional or academic title or degree awarded upon completion

Upon successful completion of the three-year undergraduate university study, students are awarded the academic title – Baccalaureus or Baccalaurea with a designation of the relevant profession (also used in international documentation and certificates in English).

The academic title is:

**SVEUČILIŠNI/A PRVOSTUPNIK/CA (BACCALAUREUS/ BACCALAUREA)
INŽENJER/KA BRODOSTROJARSTVA**

In international relations and a degree in English:

BACHELOR OF SCIENCE (BSC) IN MARINE ENGINEERING

Upon successful completion of the two-year graduate university study, students are awarded the academic title – Master of Science with a designation of the relevant profession. The academic title is:

**SVEUČILIŠNI/A MAGISTAR/MAGISTRA INŽENJER/KA BRODOSTROJARSTVA
I POMORSKE TEHNOLOGIJE**

In international relations and a degree in English:

**MASTER OF SCIENCE (MSC) IN MARINE ENGINEERING AND TECHNOLOGY
OF TRANSPORT**