University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Emergency Procedures							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
EMR402	IV	Spring	3	3	2	2	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				30	-	-	70
Course Venue and Time				Friday / 09:30 – 13:20			
Instructor information				**Cpt. Çağrı Deliceırmak** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4040 cagri.deliceırmak@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course offers a comprehensive overview of emergency procedures on board ships, with a focus on the safety and security of the crew, passengers, cargo, and the vessel. It covers the practical and theoretical aspects of emergencies, including collision, grounding, and damage control, as well as precautionary measures, emergency response, and post-incident mitigation. The course also addresses the operation and maintenance of lifesaving and firefighting systems, emergency steering and backup arrangements, coordination of rescue operations, and effective communication during emergencies. Additionally, the course introduces medical care management on board, including the use of international medical guides, first aid for hazardous cargo incidents, and medical emergency communication in English. Students will acquire the knowledge and skills necessary to respond efficiently to maritime emergencies, ensuring compliance with international regulations and safety standards.
Course Aims and Objectives	The course aims to equip students with the theoretical knowledge and practical skills required to effectively manage emergencies aboard ships, ensuring the safety of crew, passengers, and the vessel. It aims to develop an understanding of international maritime safety regulations, emergency procedures, and damage-control strategies. • Gain an understanding of how to prevent, respond to, and report emergencies such as collisions, grounding, stranding, beaching, structural damage, fire, explosion, pollution, blackout, steering, and engine failures. • Provide skills for effective emergency steering and backup arrangements. • Understand methods of emergency towing and towing arrangements. • Develop contingency and damage control planning, as well as enhance decision-making, leadership, coordination, and situational awareness skills for managing emergencies. • Familiarize with international maritime safety standards, regulations, and emergency preparedness best practices. • Develop the capability to operate and maintain lifesaving, firefighting, and other emergency systems to ensure safety on board. • Learn the coordination of search and rescue operations at sea. • Acquire knowledge in medical care management aboard ships, encompassing first aid, utilization of medical guides, and emergency communication protocols.

Course Learning Outcomes	**LO1**: Demonstrate knowledge and proficiency in emergency procedures and apply appropriate measures to mitigate risks. **LO2**: Demonstrate knowledge and proficiency in emergency steering and towing. **LO3**: Develop, execute, and assess contingency and damage control strategies to maintain vessel integrity during emergencies. **LO4**: Demonstrate leadership, decision-making, and situational awareness skills essential for managing onboard emergencies. **LO5**: Demonstrate awareness of international maritime safety standards and regulations and apply them during emergencies. **LO6**: Ensure the safety and security of the vessel, crew, and environment through the effective utilization of lifesaving, firefighting, and other emergency response systems. **LO7**: Coordinate search, rescue, and assistance operations in compliance with international maritime regulations. **LO8**: Adhere to international medical guidelines and deliver medical care within maritime environments, encompassing effective medical communication.

Content of the Course

Week	*Subject*
1	**Introduction to Emergency Procedures** Terminology and related maritime English terms Overview of shipboard emergencies Roles and responsibilities during emergencies
2	**Collision, Grounding, and Damage Control – Part 1** Terminology and related maritime English terms Precautions when beaching and grounding a vessel Actions immediately before and after beaching and grounding
3	**Collision, Grounding, and Damage Control – Part 2** Terminology and related maritime English terms Refloating grounded ships with or without assistance Emergency actions following loss of watertight integrity
4	**Damage Control Procedures** Terminology and related maritime English terms Implementation of shipboard damage control measures Organization and responsibilities of damage control teams
5	**Steering and Manoeuvring in Emergencies** Terminology and related maritime English terms Emergency steering systems, Contingency procedures for steering failure
6	**Backup Arrangements and Emergency Towing** Terminology and related maritime English terms Alternative propulsion and steering systems Emergency towing procedures and techniques
7	**Coordination of Rescue and Assistance Operations** Terminology and related maritime English terms Ship-to-ship, ship-to-shore and ship-to-air coordination in SAR operations Coordination and collaboration with search and rescue authorities
8	**Safety and Security of Crew and Passengers** Terminology and related maritime English terms Maintaining safety during evacuation and emergencies Duties and responsibilities in life-saving and firefighting operations
9	**Lifesaving Appliances and Firefighting Systems – Part 1**

	Terminology and related maritime English terms Regulations for life-saving appliances Organization of fire and abandon-ship drills
10	**Lifesaving Appliances and Firefighting Systems – Part 2** Terminology and related maritime English terms Operational maintenance of lifesaving, firefighting, and safety systems Measures to protect all personnel during emergencies
11	**Post-Incident Damage Mitigation** Terminology and related maritime English terms Actions to reduce damage after fire, explosion, collision, or grounding Restoration of ship stability and integrity
12	**Development of Emergency and Damage Control Plans** Terminology and related maritime English terms Preparation of contingency plans for various emergencies Integration of fire prevention and firefighting systems
13	**Report on Pollution** Terminology and related maritime English terms External Communication and Reporting of Pollution Legal aspects and responsibilities
14	**Medical Care on Board** Terminology and related maritime English terms International medical publications and guides Shipboard medical responsibilities Use of the International Code of Signals for medical emergencies First aid procedures for hazardous cargo incidents Sending and receiving medical emergency messages
15	**Review and Final Evaluation** Recap of emergency procedures Practical assessment and scenario-based exercises Evaluation of student competence in shipboard emergency procedures

Methods and Techniques used in the Course

Lectures and Presentations: In-depth explanations of emergency procedures, safety protocols, and maritime regulations.

Case Studies: Analysis of past maritime emergencies to identify best practices and lessons learned.

Simulation Exercises: Practical exercises using ship simulators to practice collision, grounding, and emergency response scenarios.

Demonstrations: Hands-on demonstrations of lifesaving equipment, firefighting systems, and damage control techniques.

Workshops: Interactive sessions for planning and coordinating emergency operations, including crew and passenger safety.

Role-Playing: Simulated onboard emergencies to develop decision-making, leadership, and communication skills.

Group Discussions: Collaborative analysis of safety protocols, emergency plans, and international regulations.

Practical Drills: Conducting lifeboat, firefighting, and medical emergency drills to reinforce operational readiness.

Multimedia Tools: Use of videos, diagrams, and online resources to visualize emergency procedures and safety equipment.

Assessment and Feedback: Continuous evaluation through quizzes, practical exercises, and scenario-based assessments to reinforce learning.

Sample Questions

- Describe the steps to be taken immediately before and after a ship runs aground to ensure safety and minimize damage.
- Explain the procedures for controlling flooding and structural damage after a collision at sea.
- How would you organize and coordinate a search and rescue operation following a man-overboard incident?
- Discuss the proper use and maintenance of lifesaving appliances and firefighting systems on board.
- Explain how to develop and implement an emergency response plan for fire or explosion on a ship.
- Describe the procedures for emergency steering and backup arrangements in case of steering failure.
- How is medical care provided on board, and what international medical guides and communication protocols are used?

Materials Used in the Course

Textbooks and Reference Books

- Lecturer Notes, Related IMO Model Courses and STCW (Standards of Training, Certification, and Watchkeeping) manuals.
- SOLAS Consolidated Edition, MARPOL Practical Guide, LSA Code, Marine Emergencies: For Masters and Mates, International Medical Guide for Ships
- Related IMO Model Courses and STCW (Standards of Training, Certification, and Watchkeeping) manuals.
- Maritime Safety textbooks covering onboard emergencies, shipboard emergency procedures, including collision, grounding, flooding, fire, explosion, pollution, and injuries
    - SOLAS Consolidated Edition
    - LSA Code
    - FSS Code
    - The Fire Fighting System Guidance
    - Fire Prevention and Fire Fighting
    - Emergency Procedures and General Check Lists at Sea
    - Guidelines for Contingency Plans
    - International Medical Guide for Ships

Supplementary Resources

- Instructional videos demonstrate emergency response techniques, personal safety, and the use of protective equipment.
- Interactive simulations of onboard emergency scenarios, including collision, flooding, fire, and piracy attacks.
- Online resources from the International Maritime Organization (IMO) and maritime safety training platforms.
- Mannequin and CPR training devices for first aid and life-saving practice.
- Personal Safety Equipment, including Life Jacket, Life Buoy, Immersion Suits, and TPAs.
- Personal protective equipment (PPE) such as helmets, gloves, and goggles.

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution										
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**	**CLO9**	**CLO10**
PO1	3	3	3	3	3	3	3	2	x	x
PO2	3	3	3	2	2	2	2	3	x	x
PO3	3	3	3	3	3	3	3	3	x	x
PO4	3	3	2	2	2	2	2	1	x	x
PO5	3	3	3	3	3	3	3	3	x	x
PO6	3	3	3	3	3	3	2	2	x	x
PO7	3	3	3	3	3	3	2	2	x	x
PO8	3	3	3	3	3	3	2	2	x	x
PO9	3	2	2	1	1	1	1	1	x	x
PO10	3	3	3	3	3	3	3	3	x	x
PO11	3	3	3	3	3	3	3	3	x	x
PO12	3	3	3	3	3	3	2	3	x	x

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
LO1	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO2	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO3	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO4	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO5	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO6	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO7	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Final Exam, Assignment
LO8	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Final Exam, Assignment

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
Midterm Exam	**1**	**1**	**1**
Preparation for Midterm Exam	**1**	**5**	**5**
Final Exam	**1**	**1**	**1**
Preparation for Final Exam	**1**	**5**	**5**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Research for Project(s)/Essay(s)	-	-	-
Project Writing	-	-	-
Group Work	-	-	-
In-class Discussion(s)	**15**	**1**	**15**
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory	-	-	-
Assignment(s)/Homework/Class Works	**2**	**5**	**10**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**97**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	1	10
Laboratory	-	-
Application	1	20
Field Work (Class Work)	-	-
Special Course Internship (Work Placement)	-	-
Assignment(s)/Homework/Class Works	1	20
Providing reliability and motivation for the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	-	-
Quiz	-	-
Midterms/Oral Exams	1	20
Final/Oral Exams	1	30
Total	**5**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check the instructor's web page frequently for the course announcements. • The University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Graduation Project							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
FGP444	IV	Spring	2	4	0	4	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				-	-	-	100
Course Venue and Time				Wednesday 09.30-14.20			
Instructor information				**Prof. Dr. Şenol Başkaya** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4060 senol.baskaya@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	The **Graduation Project** course is designed as a capstone experience that enables students to integrate and apply the knowledge and skills they have acquired throughout their academic studies. The course emphasizes independent research, critical thinking, problem solving, and project-based learning, guiding students through the entire process of identifying a problem, developing a theoretical and methodological framework, conducting research, and presenting their findings in a scientific manner. Through weekly guidance, students are introduced to the historical background, theoretical foundations, research methodologies, and ethical considerations relevant to their chosen field of study. They engage in practical applications, critical discussions, and collaborative or individual project work. Special emphasis is placed on scientific writing, academic presentation, and the ability to analyze and evaluate current developments in the field. By the end of the course, students are expected to complete an original project that demonstrates their capacity for independent inquiry, academic writing, and professional presentation, preparing them for advanced research or professional careers in their discipline.
Course Aims and Objectives	The main aim of the **Graduation Project** course is to provide students with the opportunity to synthesize and apply the theoretical knowledge, technical skills, and research competencies they have acquired during their undergraduate education in a comprehensive project. The course is designed to foster independent research, critical thinking, and problem-solving skills, while preparing students for professional practice and/or advanced academic studies. • Identify, define, and formulate a research problem or project topic relevant to their field of study. • Conduct a thorough literature review and establish a strong theoretical framework. • Select and apply appropriate research methods and data analysis techniques. • Develop solutions to practical or theoretical problems through independent and/or group work.

	• Adhere to ethical principles in research, including data privacy, academic honesty, and responsible authorship. • Enhance project management, teamwork, and communication skills. • Prepare a well-structured scientific report and deliver an effective academic presentation. • Demonstrate the ability to integrate multidisciplinary knowledge and apply it to real-world or research-based problems.
Course Learning Outcomes	**CLO1:** Define and formulate a research problem or project topic relevant to maritime, engineering, or related disciplines. **CLO2:** Conduct a comprehensive literature review and critically evaluate existing knowledge in the field. **CLO3:** Select and apply appropriate research methods (quantitative, qualitative, or mixed) to address the project objectives. **CLO4:** Design and implement a research/project plan, including data collection, analysis, and interpretation. **CLO5:** Apply ethical principles in conducting research, ensuring academic integrity and data security. **CLO6:** Demonstrate problem-solving and critical thinking skills in addressing complex technical or theoretical issues. **CLO7:** Collaborate effectively in individual or group projects, managing time and resources efficiently. **CLO8:** Prepare a structured scientific report that meets academic writing standards. **CLO9:** Present project outcomes effectively using oral, written, and visual communication techniques. **CLO10:** Integrate multidisciplinary knowledge and propose innovative solutions or contributions to the field.

Content of the Course

Week	*Subject*
1	**Introduction and Basic Concepts** Aim and content of the course Basic concepts and definitions related to the subject General functioning of the course and evaluation methods
2	**Historical Development and Current Situation** Historical origins of the issue Important scientists and studies in the field Current developments and debates
3	**Theoretical Framework** The main theories used to explain the topic Models and conceptual frameworks Comparison of different theories
4	**Research Methods** Methods used when conducting research on the topic Data collection techniques (questionnaire, observation, experiment etc.) Data analysis methods (statistical analysis, qualitative analysis etc.)
5	**Application Areas** Applications of the subject in different fields Practical examples and case studies Impact of technological developments
6	**Ethical Principles** Ethical principles in scientific research Data privacy and security Conflicts of interest
7	**Critical Thinking and Problem Solving** Critical thinking skills Problem solving methods Decision-making processes
8	**Scientific Writing and Presentation** Rules for writing scientific articles Academic presentation techniques
9	**Special Topics and Project** More in-depth examination of the issue Special topics according to students' interests Individual or group projects
10	Project Studies
11	Project Studies
12	Project Studies
13	Project Studies
14	Project presentations and evaluations
15	Project presentations and evaluations

Methods and Techniques used in the Course

Project-Based Learning (PBL): Students actively engage in developing and managing an individual or group project, applying theoretical knowledge to real-world problems.

Research-Oriented Approach: Emphasis is placed on independent research, literature review, data collection, and analysis.

Case Studies and Best Practices: Examination of selected examples to understand applications and challenges in the field.

Supervision and Mentorship: Regular guidance sessions with academic supervisors to monitor progress and provide feedback.

Collaborative Work: Team-based project activities to enhance communication, coordination, and problem-solving skills.

Critical Discussions and Seminars: Classroom discussions and presentations to encourage critical thinking and peer evaluation.

Scientific Writing and Presentation: Training in preparing structured reports, academic papers, and professional presentations.

Practical Application: Hands-on activities and project implementation to strengthen applied knowledge and research skills.

Sample Questions

Theoretical / Conceptual Questions

- Explain the importance of defining a clear research problem in academic studies.
- Compare and contrast quantitative and qualitative research methods in the context of maritime or engineering research.
- Discuss the role of ethical principles in scientific research and provide examples of possible ethical dilemmas in project studies.

Application-Oriented Questions

- Design a basic project proposal including: research question, objectives, methodology, and expected outcomes.
- Prepare a sample data collection plan for a study on fuel efficiency in modern ship propulsion systems.
- Identify potential risks and limitations of a project studying the impact of alternative fuels on shipping emissions, and propose mitigation strategies.

Critical Thinking / Case-Based Questions

- A research group has limited access to reliable data for their project. What strategies could they adopt to overcome this problem without violating research ethics?
- Imagine you are preparing a graduation project on “Digitalization in Port Operations.” Outline the key steps you would follow to ensure that your project is scientifically valid and practically useful.
- Review the following project abstract (given in the exam) and identify its strengths and weaknesses in terms of clarity, methodology, and scope.

Presentation / Reporting Questions

- What are the essential components of an academic project report, and why is each important?
- How would you structure a 10-minute oral presentation of your graduation project to effectively communicate your findings to both technical and non-technical audiences?

Materials Used in the Course

Core References and Textbooks

- Books and handbooks on scientific research methods, project design, and academic writing.
- Standard references on methodology, statistical analysis, and case study applications.

Supplementary Resources

- Scientific journals, conference proceedings, and recent academic publications related to students' project topics.
- Technical reports, industry standards, and guidelines from international organizations (e.g., IMO, ISO, IACS).

Digital and Online Resources

- University's online library databases (e.g., ScienceDirect, Springer, Taylor & Francis).
- Online tools for data collection and analysis (SPSS, MATLAB, R, NVivo, Excel).
- Reference management tools (Zotero, EndNote, Mendeley).

Practical Materials

- Laboratory facilities, simulation software, and technical equipment where applicable.
- Fieldwork instruments such as questionnaires, observation checklists, and measurement devices.
- Case study materials provided by instructors or external stakeholders (e.g., shipping companies, maritime authorities).

Communication and Presentation Tools

- Academic writing guides and thesis formatting manuals.
- Presentation software (PowerPoint, LaTeX Beamer, Prezi) for final project defense.
- Templates for project proposals, progress reports, and final documentation.

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution										
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**	**CLO9**	**CLO10**
PO1	3	3	3	3	3	3	2	2	2	2
PO2	2	3	3	3	3	2	2	3	3	3
PO3	2	2	3	3	2	3	2	2	2	3
PO4	2	2	2	3	3	2	3	2	2	3
PO5	3	2	3	3	2	2	3	3	2	3
PO6	3	2	3	2	2	3	2	2	3	3
PO7	1	2	2	2	2	2	3	2	3	2
PO8	2	2	2	2	2	2	3	2	2	3
PO9	2	2	2	2	3	2	2	3	2	2
PO10	3	3	2	2	3	2	3	2	3	2
PO11	2	2	2	2	2	3	2	2	3	2
PO12	2	2	2	2	2	2	3	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Seminar, Guided Discussions	Assignments, Quizzes, Proposal Submission
CLO2	Literature Review Workshops, Library Research, Online Databases	Literature Review Report, Annotated Bibliography
CLO3	Lectures, Tutorials, Practical Sessions, Software Demonstrations	Research Methodology Assignment, Practical Exercises
CLO4	Project Planning Workshops, Mentorship Sessions, Lab/Field Work	Project Plan Submission, Interim Progress Reports
CLO5	Ethics Seminars, Case Studies, Group Discussions	Ethics Statement, Participation in Discussion
CLO6	Problem-Based Learning, Tutorials, Critical Analysis Exercises	Problem-Solving Reports, Case Study Analyses
CLO7	Group Projects, Collaborative Workshops, Team-Based Exercises	Peer Evaluation, Group Project Reports
CLO8	Academic Writing Workshops, Draft Reviews, Mentoring	Final Research Report, Structured Paper Submission
CLO9	Presentations, Poster Sessions, Oral Defence Practices	Oral Presentation, Poster Presentation, Seminar Participation
CLO10	Integrated Project Work, Case Studies, Innovation Labs	Final Project Submission, Innovation Report, Solution Proposals

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	-	-	-
Lectures	**15**	**4**	**60**
Midterm Exam	-	-	-
Preparation for Midterm Exam	-	-	-
Final Exam	-	-	-
Preparation for Final Exam	-	-	-
Presentation(s)	**1**	**10**	**10**
Preparation for Presentation(s)	**1**	**10**	**10**
Research for Project(s)/Essay(s)	**1**	**10**	**10**
Project Writing	**1**	**10**	**10**
Group Work	-	-	-
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory	-	-	-
Assignment(s)/Homework/Class Works	-	-	-
Micro-Teaching Sessions	-	-	-
Lesson Planning	**1**	**10**	**10**
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	**1**	**10**	**10**
Drawing	-	-	-
Essay Writing	**1**	**20**	**20**
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**140**
ECTS Credit			**4**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	15	10
Laboratory	-	-
Application	1	10
Field Work	1	20
Special Course Internship (Work Placement)	-	-
Homework/Assignments	-	-
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	1	30
Project	1	30
Quiz	-	-
Midterms/Oral Exams	-	-
Final/Oral Exams	-	-
Total	**5**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: First Aid and Medical Care							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
FMC402	IV	Spring	3	3	2	2	0
Course type: Compulsory Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				30	-	-	70
Course Venue and Time				Tuesday / 08:30 – 12:20			
Instructor information				**Uz.Dr. Kasım Bozgeyik** Faculty of Maritime Studies Wednesday / 09:00 – 12:00 +90 (392) 650 26 00 / 4060 kasim.bozgeyik@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course provides comprehensive knowledge and practical skills in maritime first aid and medical care. It covers the fundamentals of human anatomy, common illnesses, and the use of medicines in a maritime context, with a focus on effective communication in medical emergencies. Students will learn to apply first aid techniques in cases of injury, illness, poisoning, burns, fractures, and environmental effects, as well as to provide extended medical care on board until professional assistance becomes available. The course also introduces international medical references such as the International Medical Guide for Ships (IMGS), the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG), and the medical pages of the International Code of Signals. Emphasis is placed on the prevention of diseases, maintaining hygiene on board, record-keeping, and compliance with international maritime medical regulations. Practical skills, including patient examination, wound treatment, suturing, bandaging, pharmacology, sterilization, and radio-medical communication, are developed to prepare students for real-life medical emergencies at sea. The course will be conducted in accordance with the IMO Model Courses 1.14, and 1.15, as well as the national regulation “Egitim Sinav Yonergesi 2025” of the Turkish Republic. Successful students will obtain mandatory STCW certificates of (1); Medical First Aid, (2); Medical Care.
Course Aims and Objectives	The primary aim of this course is to equip students with the essential knowledge, skills, and competencies necessary to deliver effective first aid and medical care on board ships, in accordance with international maritime standards and guidelines. The course prepares students to respond appropriately to medical emergencies, manage injuries and illnesses, and apply preventive healthcare measures in maritime environments. • Comprehend the fundamental framework and roles of the human body concerning first aid and medical treatment. • Communicate effectively in English during medical emergencies, utilizing international codes, guides, and telemedical support. • Identify and respond to common injuries, such as fractures, burns, wounds, and spinal trauma, with proper first aid techniques. • Ensure the application of appropriate procedures during life-threatening emergencies, including cardiopulmonary resuscitation (CPR), drowning incidents, and asphyxia cases. • Utilize the Medical First Aid Guide (MFAG) and other international medical references for handling hazardous materials and poisoning cases. • Provide medical care for both acute and chronic medical conditions, including infectious and tropical diseases. • Deliver specialized care for patients with gynecological, obstetric, dental, and mental health conditions on board. • Implement preventive health measures, including hygiene, vaccination, disinfection, and environmental control on ships. • Maintain precise medical records in accordance with international and national maritime regulations.

	• Cooperate effectively with external medical services, including radio medical advice, medical evacuation, and port health authorities.
Course Learning Outcomes	**LO1**: Describe the structure and functions of the human body that are important for first aid and medical care. **LO2**: Demonstrate effective communication in English during medical emergencies by employing standard medical terminology, adhering to the International Code of Signals, and utilizing telemedical procedures. **LO3**: Identify and assess symptoms associated with common injuries and illnesses, such as burns, fractures, spinal injuries, bleeding, and shock. **LO4**: Carry out fundamental first aid procedures, such as cardiopulmonary resuscitation (CPR), wound management through dressing and bandaging, immobilization of fractures, and patient transportation methodologies. **LO5**: Implement suitable medical interventions in instances of poisoning, hazardous material exposure, and other onboard health hazards in accordance with the Medical First Aid Guide (MFAG). **LO6**: Oversee patient care onboard for both acute and chronic medical conditions, including tropical, infectious, and sexually transmitted diseases. **LO7**: Provide emergency medical assistance for exceptional cases, including pregnancy, childbirth, dental emergencies, and psychological conditions. **LO8**: Implement preventive health and hygiene measures, including vaccination, disinfection, pest control, and environmental monitoring on board. **LO9**: Maintain accurate medical records and documentation in compliance with international and national maritime medical regulations. **LO10**: Collaborate with external medical services for radio medical advice, medical evacuation, and coordination with port health authorities.

Content of the Course

Week	*Subject*
1	**Introduction to Maritime First Aid and Medical Communication** Terminology and related maritime English terms Overview of medical communication in English Anatomy of the human body and basic terminology
2	**Diseases, Medicines, and Medical Communication at Sea** Terminology and related maritime English terms Common illnesses and medications Communication procedures in medical emergencies
3	**International Medical Documentation and Guides** Terminology and related maritime English terms International Code of Signals (Medical Pages) International Medical Guide for Ships (IMGS) and related publications
4	**Fundamentals of First Aid on Board** Terminology and related maritime English terms Immediate first aid in case of accident or illness Shipboard first aid kit: content and usage
5	**Anatomy, Physiology, and Toxic Hazards** Terminology and related maritime English terms Structure and functions of the human body Use of MFAG (Medical First Aid Guide for Accidents Involving Dangerous Goods) Toxic hazards on board
6	**Patient Examination and Emergency Scenarios** Terminology and related maritime English terms Examination of casualties Spinal injuries, burns, scalds, effects of heat and cold
7	**Musculoskeletal and Respiratory Emergencies** Terminology and related maritime English terms Fractures, dislocations, muscle injuries Heart attack, drowning, asphyxia
8	**Pharmacology and Sterilization in Shipboard Medical Care** Terminology and related maritime English terms Principles of pharmacology Sterilization and infection control
9	**Medical Care on Board – Trauma and Injuries** Terminology and related maritime English terms Head and spinal injuries ENT and eye injuries External and internal bleeding Wound management and infection prevention
10	**Medical Care on Board – Trauma and Injuries** Terminology and related maritime English terms Head and spinal injuries ENT and eye injuries External and internal bleeding Wound management and infection prevention
11	**Medical Care on Board – Clinical Cases**

	Terminology and related maritime English terms Burns, cold injuries, fractures, and acute abdominal diseases Pain management, suturing, and bandaging techniques Minor surgical treatments
12	**Hygiene, Sanitation, and Preventive Medicine** Terminology and related maritime English terms Hygiene practices on board Disinfection, fumigation, rat control Vaccination and disease prevention
13	**Records, Regulations, and External Assistance** Terminology and related maritime English terms Medical record-keeping International and national maritime medical regulations External medical assistance and coordination Radio medical advice and its application
14	**Records, Regulations, and External Assistance** Terminology and related maritime English terms Medical record-keeping International and national maritime medical regulations External medical assistance and coordination Emergency evacuation and transportation of the patient with helicopters or any other vehicles
15	**Review, Case Studies, and Final Assessment** Integrated medical scenarios Case study discussions (injuries, diseases, evacuations) Course wrap-up and final evaluation

Methods and Techniques used in the Course

Lectures & Multimedia Presentations – Theoretical concepts related to anatomy, medical conditions, and first aid procedures are taught with visual aids, slides, and videos.

Classroom Discussions & Case Studies – Students analyze real-life maritime medical incidents to enhance problem-solving and decision-making skills.

Demonstrations & Practical Exercises – First aid techniques such as CPR, bandaging, fracture immobilization, and patient transport are demonstrated and practiced in a controlled environment.

Simulation-Based Training – Use of medical manikins, emergency kits, and shipboard scenarios to simulate accidents, hazardous material exposure, and medical emergencies at sea.

Role-Playing & Communication Drills – Students practice radio medical advice, use of International Code of Signals, and medical communication in English.

Group Work & Peer Learning – Collaborative activities to foster teamwork in providing first aid and patient care on board.

Use of Training Manuals & Guidelines – Application of the *Medical First Aid Guide (MFAG)*, *International Medical Guide for Ships (IMGS)*, and national maritime health publications.

Laboratory & Hands-on Training – Practice of sterilization, suturing, wound dressing, and use of medical equipment.

Assessment-Oriented Activities – Quizzes, oral questioning, and scenario-based evaluations to reinforce learning outcomes.

Sample Questions

Multiple Choice Questions (MCQs)

- Which of the following is the primary purpose of the *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)*?

  a) To provide guidelines for patient nutrition at sea

  b) To assist in treating illnesses caused by poor hygiene

  c) To provide first aid instructions in cases of hazardous material exposure

  d) To guide the communication protocol with port authorities

- Which of the following is NOT a recommended step when treating a spinal injury on board?

  a) Keep the patient still and immobilize the spine

  b) Move the patient quickly to avoid further injury

  c) Use a rigid stretcher if available

  d) Avoid unnecessary movement of the head and neck

- What is the main purpose of sterilization in medical care on ships?

  a) Pain reduction

  b) Prevention of infection

  c) Faster wound healing

  d) Relief of stress for the patient

Short-Answer Questions

- List three essential items that should be found in a ship's first aid kit.
- Explain the difference between *first aid* and *medical care* on board.
- Identify two common tropical diseases that seafarers should be aware of and describe one method of prevention for each.

Materials Used in the Course

Textbooks and Official Guides

- Lecturer Notes, Related IMO Model Courses and STCW (Standards of Training, Certification, and Watchkeeping) manuals.
- International Medical Guide for Ships (IMGS), the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG), and the medical pages of the International Code of Signals.

Supplementary Resources

- Instructional videos
- Interactive simulations
- Standard shipboard first aid kits and medical chests.
- Mannequins for CPR and first aid practice.
- Splints, stretchers, bandages, dressings, sterilization, and immobilization devices.
- Simulation equipment for burns, fractures, and trauma care.

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution										
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**	**CLO9**	**CLO10**
PO1	1	1	1	1	1	1	1	1	1	1
PO2	1	1	1	1	1	1	1	1	1	1
PO3	3	3	3	3	3	3	3	3	3	3
PO4	0	0	0	0	0	0	0	0	0	0
PO5	2	2	2	2	2	2	2	2	2	2
PO6	2	2	2	2	2	2	2	2	2	2
PO7	1	1	1	1	1	1	1	1	1	1
PO8	1	1	1	1	1	1	1	1	1	1
PO9	1	1	1	1	1	1	1	1	1	1
PO10	3	3	3	3	3	3	3	3	3	3
PO11	2	2	2	2	2	2	2	2	2	2
PO12	2	2	2	2	2	2	2	2	2	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
LO1	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO2	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO3	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO4	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO5	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO6	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO7	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO8	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO9	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment
LO10	Lectures, Practical Applications, Case Studies, and Discussions	Midterm Exam, Practical Exam, Final Exam, Assignment

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**2**	**30**
Midterm Exam	**1**	**1**	**1**
Preparation for Midterm Exam	**1**	**5**	**5**
Final Exam	**1**	**1**	**1**
Preparation for Final Exam	**1**	**5**	**5**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Research for Project(s)/Essay(s)	-	-	-
Project Writing	-	-	-
Group Work	-	-	-
In-class Discussion(s)	**15**	**1**	**15**
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory	**15**	**1**	**15**
Assignment(s)/Homework/Class Works	-	-	-
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**87**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	1	10
Laboratory	-	-
Application	1	40
Field Work	-	-
Special Course Internship (Work Placement)	-	-
Assignment(s)/Homework/Class Works	-	-
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	-	-
Quiz	-	-
Midterms/Oral Exams	1	20
Final/Oral Exams	1	30
Total	**4**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check the instructor's web page frequently for the course announcements. • The University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Automatic Control							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED402	IV	Spring	3	3	3	0	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	-	30	50
Course Venue and Time				Wednesday 09.30-12.20			
Instructor information				**Chf. Eng. Volkan Varışlı** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4095 volkan.varisli@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	The Automatic Control course provides an in-depth exploration of marine automation and control systems, focusing on the integration of electrotechnical and hydraulic/pneumatic systems on board ships. The course covers the principles, design, and application of automatic control, emphasizing the theory and practice of PID controllers, process control, and both analog and digital control systems. Students will gain knowledge in the use of electrical inspection tools, high-tech measurement devices, and e-reporting systems for monitoring and maintaining shipboard automation equipment. The course also addresses safety regulations, remote indication systems, and the management of critical engine room alarms and power systems. Through case studies, practical applications, and project-based learning, students will develop skills in modeling, system stability analysis, and troubleshooting automated control systems. The course emphasizes operational efficiency, safety, and the management of auxiliary and propulsion systems under varying marine conditions. By the end of the course, students will be able to design, analyze, and maintain automatic control systems, integrate automation into marine operations, and apply problem-solving strategies to ensure safe, efficient, and reliable vessel operation.
Course Aims and Objectives	**Course Aims** The aim of this course is to provide students with a comprehensive understanding of automatic control systems used in marine engineering. The course focuses on both the theoretical foundations and practical applications of control systems, including electrical, hydraulic, and pneumatic automation. Students will learn to design, operate, and troubleshoot control systems while ensuring safety, reliability, and operational efficiency on board ships. **Course Objectives** By the end of this course, students will be able to: • Understand the fundamental principles of automatic and process control systems in marine applications. • Apply knowledge of PID controllers, open and closed-loop systems, and stability analysis in shipboard automation. • Utilize electrical inspection tools, high-tech measurement devices, and e-reporting systems for monitoring and maintenance. • Interpret control system diagrams, symbols, and functional schematics for hydraulic, pneumatic, and electrical systems. • Operate and manage engine room alarms, remote indication systems, and power management systems effectively. • Develop problem-solving skills for troubleshooting faults in automated marine systems. • Integrate automation technologies into shipboard operations for improved efficiency, safety, and reliability.

Course Learning Outcomes	**CLO1:** Understand and explain the principles of automatic and marine electrotechnical control systems, including PID, open-loop, and closed-loop control. **CLO2:** Analyze and model control systems for hydraulic, pneumatic, and electrical machinery used onboard ships. **CLO3:** Apply measurement, sensing, and signal amplification techniques for operational control and safety monitoring. **CLO4:** Interpret and design analog and digital control systems, including feedback mechanisms, noise reduction, and software-based control applications. **CLO5:** Operate and troubleshoot marine automation systems such as propulsion control, auxiliary machinery automation, and deck equipment systems. **CLO6:** Implement safety protocols and remote monitoring procedures to prevent failures and maintain operational integrity in marine control systems.

Content of the Course

Week	*Subject*
1	General aspects of Marine Electrotechnical equipment, characteristics, low and high voltage
2	Fundamental safety regulations, electrics/electrotechnological marine electrical components' safety requirements, mechanism and maintenance.
3	Use of Electrical inspection tools and high-tech measurement devices, determination tools and reporting or e-reporting
4	Principles of Control systems Characteristic of PID and process control, Gain values.
5	Principle of automation control systems and related supplementary. Measurement and control, Measurement systems, Control equipment, Sensors, Measurement of signal amplifiers, noise reduction techniques
6	Principles of automatic controls, safety systems and remote indication systems. Basic components, drawings, symbols and control procedure function. Control systems for hydraulic, pneumatic systems.
7	Modeling of control systems, Inlet and outlet functions of control systems, modulated systems and their functional diagrams with control systems. Control system changeovers, other transfer functions, system stability. Open and closed loop control systems
8	Mid-term Application (Understanding of Automational control and failure)
9	Analog and digital control systems, Calculation of digital control system and function data, Measurement and control, Measurement systems, Control equipment, Sensors, Measurement of signal amplifiers, noise reduction techniques, Software versional control systems
10	Engine room alarm system components with Case studies: Level indication, safety level controls and indicational other remote systems and functional remote systems.
11	Power management systems with case studies: Load control on Aux. machinery and synchronization, control of main engine speed and load control, measurement of level of the boiler, combustion and steam pressure, T/O temperature cooling water, fuel and lub.oil temperature and pressure systems.
12	Automational control and Safety Systems witj case studies: Automation systems for Marine propulsion engines including oil mist detection. Electrical propulsion engine applications. Remote management of propeller and steering gear machinery.
13	Remote Control management with case studies: Heating, air handling and refrigeration unit, Pumps, separator and pipelines control, Control of loading equipments and deck machinery
14	Automation system functions on remote protecting devices, faults and their failures. Safety precautions and malfunctional correction/trouble shooting.
15	Final Exam Application (Operational management and Troubleshooting)

Methods and Techniques Used in the Course

Lectures and Theoretical Instruction:

- Interactive lectures covering fundamental and advanced principles of automatic control, system modeling, and marine electrotechnology.
- Case-based discussions to illustrate real-world applications and problem-solving in marine control systems.

Laboratory and Simulation Exercises:

- Hands-on exercises with control system simulators and instrumentation for hydraulic, pneumatic, and electrical systems.
- Practical demonstrations of measurement, sensing, and feedback system applications.

Problem-Solving Workshops:

- Structured sessions on designing, modeling, and analyzing control loops.
- Exercises on fault identification, troubleshooting, and corrective action in automated marine systems.

Group Projects and Team-Based Activities:

- Collaborative projects focusing on automation system integration, safety management, and remote-control operation.
- Group assignments to develop operational strategies and optimize system performance.

Case Studies and Applied Learning:

- Real-life scenarios including failure analysis, operational troubleshooting, and safety management of marine control systems.
- Application of standards, regulations, and best practices in marine automation.

Assessment Techniques:

- Mid-term and final exams testing both theoretical knowledge and applied problem-solving.
- Continuous assessment through assignments, practical exercises, and project presentations.

Sample Questions

Multiple Choice Questions (MCQs)

- Which of the following describes the main function of a PID controller?

  a) To convert AC to DC

  b) To control process variables through proportional, integral, and derivative actions

  c) To measure signal noise

  d) To increase motor speed without feedback

- In a closed-loop control system, the feedback signal is used to:

  a) Reduce the system's response time

  b) Compare actual output with the desired setpoint

  c) Power the sensors

  d) Generate random signals

Short Answer / Theory Questions

- Explain the difference between open-loop and closed-loop control systems in marine applications.
- Describe the basic components of a hydraulic control system and their functions.
- What are the main safety precautions when working with automation systems on a ship?

Calculation / Problem-Solving Questions

- A proportional controller with gain Kp=2K_p = 2Kp=2 is applied to a system with setpoint 50 units and measured output 45 units. Calculate the controller output.
- Draw and label a block diagram of a closed-loop automatic control system including sensor, controller, actuator, and plant.
- Given a PID controller with specific gain values, design a control loop to maintain engine room temperature within ±2°C.

Case Study / Applied Questions

- A hydraulic pump in a deck crane fails during operation. Outline a step-by-step troubleshooting and corrective action plan, including use of sensors and alarm system feedback.
- Analyze a scenario where the automatic control system of a propulsion engine shows oscillatory behavior. Identify potential causes and propose corrective measures.

Materials Used in the Course

Textbooks and Reference Books

- Ogata, K., *Modern Control Engineering*, 6th Edition, Pearson, 2020.
- Dorf, R. C. & Bishop, R. H., *Modern Control Systems*, 14th Edition, Pearson, 2021.
- Nise, N. S., *Control Systems Engineering*, 8th Edition, Wiley, 2020.
- J. J. D'Azzo & C. H. Houpis, *Linear Control System Analysis and Design*, 5th Edition, CRC Press, 2020.

Course Lecture Notes

- Instructor-prepared lecture slides covering marine automation systems, hydraulic/pneumatic controls, PID theory, open/closed-loop systems, safety regulations, and case studies.

Laboratory and Simulation Tools

- MATLAB/Simulink for modeling, simulation, and control system analysis.
- PLC simulators for automation exercises.
- Hydraulic and pneumatic control kits for practical demonstrations.
- Engine room automation simulation software (e.g., TECHSIM, Transas E/R simulator).

Academic Articles and Standards

- International Maritime Organization (IMO) guidelines and SOLAS Chapter V for marine automation systems.
- Technical papers on marine propulsion control, remote monitoring systems, and industrial automation.

Safety and Measurement Equipment

- Multimeters, oscilloscopes, signal amplifiers, sensors, and measurement devices for applied lab exercises.
- High-tech inspection and monitoring devices for remote control system verification.

Online Resources

- IEEE Xplore digital library for latest research in control systems and marine automation.
- Manufacturer manuals for hydraulic, pneumatic, and electrotechnical equipment.
- Video demonstrations and e-learning modules for troubleshooting, alarm systems, and remote-control applications.

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution						
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	1	2	2	2	3	2
PO2	2	3	3	3	3	3
PO3	1	2	2	2	2	2
PO4	1	2	2	2	2	2
PO5	3	1	1	1	1	2
PO6	1	1	1	1	1	2
PO7	1	1	1	1	1	2
PO8	1	1	1	1	1	2
PO9	1	1	1	1	1	1
PO10	0	2	2	2	2	3
PO11	2	1	1	1	1	2
PO12	3	1	1	1	1	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Question-Answer, Discussion, Productional application,	Application, Quiz, Midterm Exam, Final Exam
CLO2	Lecture, Problem-Solving Sessions, Group Discussion, Production	Assignments, In-Class Application, Term Project, Midterm Exam
CLO3	Lecture, Problem-Solving, Hands-on Practice, Brainstorming, Production	Project, Assignments, Quizzes, Midterm Exam, Final Exam
CLO4	Lecture, Demonstration, Hands-on Practice	Productional applicationi Assignments, Midterm Exam, Final Exam
CLO5	Lecture, Practice Sessions, In-Class Activities	Application, Assignments, Quizzes, Midterm Exam, Final Exam
CLO6	Lecture, Question-Answer, Discussion, Brain Storming	Midterm Exam, Final Exam

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
Midterm Exam	**1**	**1**	**1**
Preparation for Midterm Exam	**1**	**2**	**2**
Final Exam	**1**	**1**	**1**
Preparation for Final Exam	**1**	**2**	**2**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Case Studies / Critical Thinking	-	-	-
Project Writing	**2**	**3**	**6**
Group Work	**1**	**3**	**3**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**3**	**3**	**9**
Assignment(s)/Homework/Class Works	**3**	**3**	**9**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**93**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	3	15
Field Work	1	5
Special Course Internship (Work Placement)	-	-
Homework/Assignments	3	15
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	2	5
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**11**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Engine Room Simulator							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED404	IV	Spring	2	3	1	2	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	-	30	50
Course Venue and Time				Wednesday 09.30-12.20			
Instructor information				**Chf. Eng. Volkan Varışlı** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4095 volkan.varisli@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	The Engine Room Simulator course is designed to provide students with practical and operational knowledge of marine engineering systems using advanced simulation tools such as TECHSIM5000 and TRANSAS etc., The course focuses on developing the skills required for safe and efficient engine room operations, emphasizing shipboard working environments, machinery performance monitoring, waste management according to MARPOL regulations, and adherence to international watch-keeping standards. Students will gain hands-on experience in diagnosing machinery issues, performing operational assessments, and managing propulsion performance. Key areas include fuel and lubrication management, engine performance analysis, and evaluation of operational failures with a focus on risk management. The course also covers permitting procedures, root-cause analysis, emergency response, and effective communication between engine room and bridge teams. Through simulations, case studies, and interactive exercises, students will develop competencies in operational management, teamwork, and decision-making in a controlled and realistic engine room environment. The course integrates theoretical knowledge with practical applications to prepare students for professional duties in marine engineering operations and shipboard safety compliance.
Course Aims and Objectives	**Course Aims** The aim of this course is to provide students with practical and theoretical knowledge necessary for safe, efficient, and effective operation of engine room systems aboard ships. The course seeks to develop competencies in machinery performance monitoring, propulsion management, waste handling, emergency response, and team coordination, using advanced engine room simulators. **Course Objectives** By the end of the course, students will be able to: • Operate engine room simulator systems (TECHSIM5000, TRANSAS etc.,) in line with real shipboard conditions and safety standards. • Diagnose machinery issues and evaluate performance, including fuel, lubrication, and auxiliary systems. • Apply MARPOL regulations for waste management, including handling bilge, sewage, and exhaust gas systems. • Analyze operational failures, plan corrective measures, and implement preventative actions. • Coordinate effectively within engine room teams and communicate with bridge personnel during normal operations and emergencies. • Perform risk assessments, permit-to-work procedures, and root-cause analyses for safe operations. • Document engine room operations, monitor key parameters, and prepare operational and incident reports.

Course Learning Outcomes	**CLO1:** Demonstrate competence in operating marine engine room simulators under realistic shipboard conditions. **CLO2:** Monitor and analyze the performance of main and auxiliary machinery, including fuel, lubrication, and propulsion systems. **CLO3:** Apply international maritime environmental regulations (e.g., MARPOL Annexes I, IV, VI) in engine room operations. **CLO4:** Identify machinery failures, perform troubleshooting, and implement corrective and preventive measures. **CLO5:** Execute engine room watchkeeping duties safely, including permit-to-work procedures and emergency protocols. **CLO6:** Communicate and coordinate effectively with bridge and deck teams during routine operations and critical situations.

Content of the Course

Week	*Subject*
1	Orientation of Marine Engine' Simulator TECHSIM5000, TRANSAS etc., –E/R, Shipboard Working Environment, Standards of marine engineering watch-keeping
2	Machinery diagnosis, local and remote measurement, Demonstrations of changing on performance criteria, failure analysis of machinery equipment performance evaluations
3	Waste Management: Marpol Annex I, Reg. 14 equipment: OWS, start-up, operation and record keeping, Methods of bilge water recycling
4	Waste Management: Marpol Annex IV, equipment: Black water, grey water, and sewage treatment. System start-up, operation and record keeping,
5	Waste Management: Marpol Annex VI, equipment: Fuel types, low suphure and fuel changeovers, calculations and planning, propulsion engine performance management, EGCS applications.
6	Propulsive performance analysis I - Fuel consumption and ingredients
7	Propulsive performance analysis II – Lubrication and operation with existing conditions
8	Mid-Term Exam Application (Operational level management)
9	Performance deduction, failures, risk management and voyage-end linkage, reports, analysis and management reports in ISM
10	Engine room awareness in team management and potential troubles and troubleshooting
11	Permitting to work in engine room demonstrations, root-cause analysis
12	Case study – Engine failure and recovery / Analysis and evaluations
13	Case study – Bridge Communication failure and recovery / Analysis and evaluations
14	Emergency procedures and reporting
15	Final Exam Application (Operational level team management)

Methods and Techniques Used in the Course

Simulator-Based Training:

- Hands-on use of marine engine room simulators (e.g., TECHSIM5000, TRANSAS) to replicate real shipboard engine operations.
- Practice scenarios include normal operation, failure management, and emergency response.

Case Studies and Scenario Analysis:

- Analysis of engine failures, bridge-communication failures, and environmental compliance cases.
- Group discussion and problem-solving exercises to develop critical thinking and decision-making skills.

Practical Exercises:

- Monitoring and controlling main and auxiliary machinery systems.
- Fuel management, lubrication systems, compressed air, and boiler operations in simulated environments.

Team-Based Learning:

- Collaborative exercises to simulate engine room teamwork, communication with bridge, and integrated ship operations.

Documentation and Reporting:

- Recording operational parameters, incident reports, and performance logs.
- Application of ISM procedures and regulatory reporting requirements.

Emergency Response Drills:

- Simulation of emergency scenarios, black-out, dead-ship situations, and recovery procedures.
- Application of safety procedures, alarm response, and troubleshooting techniques.

Guided Demonstrations and Instructor Feedback:

- Instructor-led demonstrations of engine systems and auxiliary operations.
- Continuous feedback during simulations to improve operational skills and situational awareness.

Sample Questions

Multiple Choice / True-False:

- Which of the following is the correct sequence to start a main engine in a black-start scenario?
- True or False: OWS (Oily Water Separator) operation is part of MARPOL Annex I compliance.
- The EGCS (Exhaust Gas Cleaning System) is primarily used to reduce which emissions?
- Which instrument is used to monitor fuel consumption in real-time on a marine engine simulator?

Short Answer / Definitions:

- Define “dead-ship condition” and explain the steps to recover from it.
- Explain the purpose of a permit-to-work system in the engine room.
- List three critical safety checks before entering the engine room for maintenance operations.

Problem-Solving / Application Questions:

- During a simulation, the main engine shows high cylinder temperature and low RPM. Identify possible causes and corrective actions.
- Calculate the fuel consumption per hour for a diesel engine given the following parameters: [provide simulated data].
- Simulate and document the correct procedure for transferring fuel from a bunker tank to the main engine day tank.

Case Study / Scenario-Based Questions:

- During a voyage simulation, a bilge water pump fails. Describe the steps you would take to safely manage the situation while maintaining compliance with MARPOL.
- Analyze a simulated engine room blackout event. How would you restore propulsion and maintain safety onboard?
- In a scenario where the bridge reports excessive vibration from the propeller shaft, explain how you would investigate and report findings.

Practical / Simulation-Based Exercises:

- Demonstrate proper operation of the main and auxiliary engines during a sudden maneuvering requirement.
- Using the simulator, perform a coordinated start-up of main engine and auxiliary generator under normal operating conditions and document the steps.

Materials Used in the Course

Textbooks & Reference Books:

- **"Marine Engineering"** – D.A. Taylor / Butterworth-Heinemann
- **"Shipboard Engineering Practice"** – P. Hyde
- **"Marine Auxiliary Machinery"** – H.D. McGeorge
- **IMO Model Course 2.07: Engine Room Simulator Training**
- **MARPOL and ISM Code Guidelines** – International Maritime Organization (IMO)

Simulator Software & Hardware:

- **TECHSIM5000, TRANSAS etc., Marine Engine Simulator** – Main and auxiliary engine simulation, engine room operations, emergency scenarios. Propulsion, auxiliary systems, fuel, and safety training.
- **Simulated Engine Room Control Panels** – Switchboards, alarms, and measurement devices for practical exercises.

Practical Tools & Resources:

- Engine room instrumentation manuals, schematics, and layout diagrams.
- Checklists for watch-keeping, emergency drills, and operational procedures.
- Case study documents and problem-based scenarios for operational exercises.
- Logs and reporting templates for fuel, engine performance, maintenance, and environmental compliance.

Online / Supplementary Resources:

- IMO e-learning modules on engine operations, safety, and environmental regulations.
- Technical datasheets and maintenance manuals of common marine engines and auxiliaries.
- Video demonstrations of engine room operations, emergency drills, and simulator exercises.

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution						
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	1	2	2	2	3	2
PO2	2	3	3	3	3	3
PO3	1	2	2	2	2	2
PO4	1	2	2	2	2	2
PO5	3	1	1	1	1	2
PO6	1	1	1	1	1	2
PO7	1	1	1	1	1	2
PO8	1	1	1	1	1	2
PO9	1	1	1	1	1	1
PO10	0	2	2	2	2	3
PO11	2	1	1	1	1	2
PO12	3	1	1	1	1	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Question-Answer, Discussion, Productional application,	Application, Quiz, Midterm Exam, Final Exam
CLO2	Lecture, Problem-Solving Sessions, Group Discussion, Production	Assignments, In-Class Application, Term Project, Midterm Exam
CLO3	Lecture, Problem-Solving, Hands-on Practice, Brainstorming, Production	Project, Assignments, Quizzes, Midterm Exam, Final Exam
CLO4	Lecture, Demonstration, Hands-on Practice	Productional applicationi Assignments, Midterm Exam, Final Exam
CLO5	Lecture, Practice Sessions, In-Class Activities	Application, Assignments, Quizzes, Midterm Exam, Final Exam
CLO6	Lecture, Question-Answer, Discussion, Brain Storming	Midterm Exam, Final Exam

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	-	-	-
Lectures	**15**	**3**	**45**
Midterm Exam	**1**	**2**	**2**
Preparation for Midterm Exam	**1**	**6**	**6**
Final Exam	**1**	**2**	**2**
Preparation for Final Exam	**1**	**6**	**6**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Case Studies / Critical Thinking	-	-	-
Project Writing	-	-	-
Group Work	**4**	**3**	**12**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**6**	**3**	**18**
Assignment(s)/Homework/Class Works	**4**	**3**	**12**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**103**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	6	20
Field Work	4	10
Special Course Internship (Work Placement)	-	-
Homework/Assignments	4	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	-	-
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**16**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Operations and Maintenance of Main and Auxiliary Machinery II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED406	IV	Spring	3	4	2	2	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	-	30	50
Course Venue and Time				Wednesday 09.30-13.20			
Instructor information				**Chf. Eng. Volkan Varışlı** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4095 volkan.varisli@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course provides advanced theoretical and practical knowledge on the operation, maintenance, and safe management of main and auxiliary machinery onboard ships. Emphasis is placed on shipboard repair planning, drydock operations, and the principles of safe machinery handling in marine environments. Students will gain in-depth understanding of propulsion and steering systems, their operational safety mechanisms, and maintenance requirements. The course covers the operation, maintenance, and management of deck machinery, including winches, cranes, davits, gangways, and other essential shipboard equipment. Students will develop skills in inspection techniques, record-keeping, analysis, and reporting according to both internal shipboard procedures and external survey requirements. Integration with ISM-Code, port and flag state inspections, and practical application of safety protocols are key components of the course. Through laboratory sessions, case studies, and simulator exercises, students will apply their knowledge in planning, executing, and supervising maintenance operations. They will also practice risk assessment, repair planning, and coordination of shipboard systems to ensure safe, efficient, and compliant operations. The course combines theoretical lectures with hands-on applications, preparing students for professional responsibilities in marine engineering, including troubleshooting, emergency response, and effective machinery management.
Course Aims and Objectives	**Course Aims** The course aims to provide students with advanced knowledge and practical skills in the operation, maintenance, and management of main and auxiliary machinery onboard ships. It emphasizes safe shipboard practices, effective machinery monitoring, and adherence to regulatory requirements, preparing students to handle complex marine engineering tasks in both routine and emergency situations. **Course Objectives** By the end of this course, students will be able to: • Apply principles of safe maintenance and repair planning in shipboard, drydock, and shipyard environments. • Understand and operate propulsion and steering systems, including safety mechanisms, alignment, and control procedures. • Plan, execute, and evaluate maintenance operations of deck machinery and auxiliary systems efficiently. • Integrate ISM-Code compliance into maintenance, inspection, and repair operations. • Conduct thorough inspections, surveys, and record-keeping for both machinery and hull components. • Analyze operational risks, troubleshoot machinery issues, and implement corrective measures. • Collaborate effectively in team settings to manage machinery operations and emergency procedures.

Course Learning Outcomes	**CLO1:** Demonstrate advanced understanding of shipboard main and auxiliary machinery, including propulsion and steering systems. **CLO2:** Apply safe maintenance and repair practices in shipboard, drydock, and shipyard environments. **CLO3:** Operate and monitor propulsion, steering, and deck machinery systems while ensuring compliance with safety and regulatory standards. **CLO4:** Plan, execute, and evaluate maintenance and repair activities using ISM-Code guidelines. **CLO5:** Conduct systematic inspections and surveys of machinery and hull components, recording and analyzing results accurately. **CLO6:** Identify machinery failures, perform root-cause analysis, and implement corrective actions effectively.

Content of the Course

Week	*Subject*
1	Shipboard safe repair planning and methods of marine engineering in marine environment, in the shipyard and drydock
2	Propulsion mechanism removal and installations, alignment and controls
3	Operational safety system of propulsion equipment
4	Principles of maneuvering steering gear, types, rudder, rudder boss, out and inboard sealing systems,
5	Operational safety system of steering equipment, auxiliaries and tunnel thrusters, e-powered propulsion
6	Maintenance requirements of propulsion and steering systems
7	Ballasting, de-ballasting, anti-healing systems: Operation, maintenance and watch-keeping
8	Mid-term Application (Repair, Planning and management)
9	Deck machinery: Anchor mooring winches, cranes, davids, gangways, cleaning equipment
10	Safe working practices of inspections, record keeping, analysis and reporting
11	Safe working practices of external surveys, record keeping, analysis and certification
12	Methods of Inspection and surveys (Machinery parts)
13	Methods of Inspection and surveys (Hull parts)
14	Maintenance and repair integration with ISM-Code
15	Final Exam Application (Management of maintenance control)

Methods and Techniques Used in the Course

Lectures and Interactive Discussions: Theoretical explanations supported by real-life case studies to enhance conceptual understanding.

Laboratory and Simulator Applications: Hands-on exercises and at least 2 practical sessions on maintenance planning, machinery inspection, and operational simulations.

Assignments and Homework: Minimum of 4 individual assignments to deepen knowledge on maintenance strategies, ISM-Code integration, and safety practices.

Group Projects: At least 2 collaborative studies focusing on shipboard maintenance planning, survey practices, and reporting.

Midterm and Final Examinations: Assessing theoretical knowledge and problem-solving skills related to machinery operation and maintenance.

Case Studies and Failure Analysis: Practical evaluation of real or simulated incidents, encouraging root-cause analysis and troubleshooting.

Classroom Presentations: Student-led discussions and reports on inspection methods, survey requirements, and safety management.

Use of Visual and Technical Aids: Technical drawings, maintenance manuals, ISM documentation, and videos demonstrating best practices.

Sample Questions

Midterm & Final Exam Examples:

- Explain the safety precautions and planning steps required before performing shipboard repairs in drydock.
- Describe the procedure for removing and reinstalling a ship's propulsion shaft. What alignment and control checks are necessary?
- Discuss the operational safety systems associated with steering gear and tunnel thrusters.
- What are the differences between inboard and outboard rudder sealing systems, and how are they maintained?
- Explain the purpose and operation of ballast and anti-heeling systems. How are they monitored and maintained?
- Define the ISM Code requirements for integrating maintenance and repair activities. Provide examples.
- What records and reports are required during deck machinery inspections? Explain their importance for certification.
- How are external surveys of hull and machinery systems carried out safely and efficiently?
- A vessel experiences a malfunction in its ballasting system during a voyage. Outline the troubleshooting steps and emergency measures to restore operation.
- Discuss how proper maintenance planning contributes to safe ship operations and compliance with international maritime regulations.

Application/Practical Case Study Questions:

- Prepare a maintenance schedule for a vessel's steering gear system, including inspection intervals and safety checks.
- Analyze a case where a failure occurred due to improper propulsion alignment. Suggest corrective and preventive measures.
- Draft a report format for inspection of anchor handling equipment and explain how findings should be recorded and submitted for survey purposes.

Materials Used in the Course

Textbooks and Reference Books:

- Marine Engineering Practice Manuals and Class Society Guidelines (e.g., Lloyd's Register, DNV-GL)
- "Marine Auxiliary Machinery" by H.D. McGeorge
- "Marine Engineering" by Roy L. Harrington
- "Propulsion and Steering Systems for Marine Engineers" (class-approved references)
- International Safety Management (ISM) Code and SOLAS regulations documentation

Technical Manuals and Publications:

- Manufacturer manuals for propulsion, steering gear, and deck machinery systems
- Drydock and shipyard repair procedures and safety manuals
- Class survey and inspection guidelines for hull and machinery

Multimedia and Simulation Tools:

- Video demonstrations and animations of propulsion and steering system operations
- Simulation software for maintenance planning and ISM integration
- Case study presentations on propulsion failures and repair planning

Shipboard Documentation Samples:

- Engine logbooks, maintenance reports, and inspection checklists
- Class survey forms, hull and machinery inspection records
- Ballast water management records and ISM maintenance reporting forms

Practical Equipment (for application sessions):

- Training models and cut sections of propulsion shafts, rudders, and sealing systems
- Hydraulic and mechanical steering gear training rigs
- Deck machinery components (e.g., winch brakes, davits) for inspection practice

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution						
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	1	2	2	2	3	2
PO2	2	3	3	3	3	3
PO3	1	2	2	2	2	2
PO4	1	2	2	2	2	2
PO5	3	1	1	1	1	2
PO6	1	1	1	1	1	2
PO7	1	1	1	1	1	2
PO8	1	1	1	1	1	2
PO9	1	1	1	1	1	1
PO10	0	2	2	2	2	3
PO11	2	1	1	1	1	2
PO12	3	1	1	1	1	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Question-Answer, Discussion, Productional application,	Application, Quiz, Midterm Exam, Final Exam
CLO2	Lecture, Problem-Solving Sessions, Group Discussion, Production	Assignments, In-Class Application, Term Project, Midterm Exam
CLO3	Lecture, Problem-Solving, Hands-on Practice, Brainstorming, Production	Project, Assignments, Quizzes, Midterm Exam, Final Exam
CLO4	Lecture, Demonstration, Hands-on Practice	Productional applicationi Assignments, Midterm Exam, Final Exam
CLO5	Lecture, Practice Sessions, In-Class Activities	Application, Assignments, Quizzes, Midterm Exam, Final Exam
CLO6	Lecture, Question-Answer, Discussion, Brain Storming	Midterm Exam, Final Exam

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**4**	**60**
Midterm Exam	**1**	**2**	**2**
Preparation for Midterm Exam	**1**	**6**	**6**
Final Exam	**1**	**2**	**2**
Preparation for Final Exam	**1**	**6**	**6**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Case Studies / Critical Thinking	-	-	-
Project Writing	-	-	-
Group Work	**2**	**4**	**8**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**2**	**4**	**8**
Assignment(s)/Homework/Class Works	**4**	**4**	**16**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**123**
ECTS Credit			**4**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	2	10
Field Work	2	10
Special Course Internship (Work Placement)	-	-
Homework/Assignments	4	20
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	-	-
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**10**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Refrigeration and Conditioning							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED408	IV	Spring	3	3	2	2	0
Course type: Compulsory Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	-	30	50
Course Venue and Time				Wednesday 09.30-13.20			
Instructor information				**Chf. Eng. Volkan Varışlı** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4095 volkan.varisli@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	The course **"Refrigeration and Air Conditioning"** provides students with fundamental and advanced knowledge of refrigeration and HVAC (Heating, Ventilation, and Air Conditioning) systems, with a specific focus on maritime applications. The course covers the principles of thermodynamics and heat transfer as applied to refrigeration cycles, the properties and classifications of refrigerants, and the design and operation of refrigeration systems used on ships, including cold storage rooms, reefer containers, and LNG/LPG cargo containment systems. Students will gain in-depth understanding of the main components of refrigeration systems such as compressors, evaporators, condensers, expansion devices, and auxiliary equipment. Emphasis is placed on system performance analysis, troubleshooting, and preventive maintenance strategies to ensure safety and operational efficiency onboard vessels. The air conditioning section of the course explores HVAC systems for marine applications, including engine room ventilation, accommodation air conditioning, and psychrometric processes such as heating, cooling, humidification, and dehumidification. Special attention is given to international regulations (IMO, SOLAS, MARPOL) regarding refrigeration, air conditioning, and environmental protection, particularly concerning refrigerants and energy efficiency. By the end of the course, students will be able to analyze refrigeration and air conditioning systems, identify operational problems, propose technical solutions, and apply theoretical knowledge to practical maritime engineering contexts.
Course Aims and Objectives	The primary aim of this course is to equip students with a comprehensive understanding of the theoretical principles and practical applications of refrigeration and air conditioning systems, with a particular emphasis on maritime environments. The course seeks to develop both conceptual knowledge and technical competencies that are essential for shipboard engineers and maritime professionals. • **To provide fundamental knowledge** of refrigeration principles, refrigerant properties, and the thermodynamic cycles governing refrigeration and air conditioning. • **To introduce the design, components, and operation** of marine refrigeration and air conditioning systems, including cold storage rooms, reefer containers, and HVAC systems for accommodation and engine rooms. • **To develop analytical skills** for evaluating system performance using thermodynamic and psychrometric principles. • **To enhance problem-solving abilities** through the study of common system faults, troubleshooting methods, and maintenance practices. • **To cultivate awareness of safety and environmental considerations**, particularly regarding refrigerant handling, international conventions (MARPOL Annex VI, IMO guidelines), and energy efficiency in maritime operations. • **To integrate theoretical and practical learning** by encouraging students to apply classroom knowledge to real-world maritime engineering challenges, including LNG and LPG cargo cooling systems. • **To prepare students for professional responsibilities** in shipboard operations by fostering technical competence, regulatory compliance, and sustainability in refrigeration and air conditioning practices.

Course Learning Outcomes	**CLO1 – Fundamental Principles** Explain the fundamental principles of refrigeration and air conditioning systems, including thermodynamic cooling processes and the classification of refrigerants, compressors, condensers, evaporators, and auxiliary components. **CLO2 – System Analysis & Performance Evaluation** Analyze the operation and performance of marine refrigeration and air conditioning systems using thermodynamic cycles, COP calculations, psychrometric properties, and performance assessment methods. **CLO3 – Practical Operation & Troubleshooting** Demonstrate practical knowledge of marine refrigeration and air conditioning systems—including cold rooms, reefer containers, ER and accommodation AC units—and diagnose faults using systematic troubleshooting techniques. **CLO4 – Environmental & Regulatory Compliance** Evaluate the environmental and regulatory impacts on marine HVAC systems, including MARPOL Annex VI, F-gas regulations, IMO standards, and safe refrigerant management practices. **CLO5 – Optimization & Applied Problem-Solving** Apply engineering problem-solving techniques to optimize the performance, efficiency, and safety of refrigeration and HVAC systems in maritime applications, including LNG/LPG cargo cooling and energy-efficient operation. **CLO6 – Professional Practice & Communication** Integrate theoretical knowledge with practical applications through case studies, system calculations, and real-life examples, while effectively communicating technical terminology in written and oral professional maritime contexts.

Content of the Course

Week	*Subject*
1	**Introduction to Refrigeration and Refrigerants** • Historical development of refrigeration systems and applications in the maritime sector • Definition of refrigeration and heat pump concepts • Classification of refrigerants: CFCs, HCFCs, HFCs, natural refrigerants (NH_3, CO_2, hydrocarbons) • Environmental and safety considerations: ODP, GWP, Montreal and Kyoto Protocols
2	**Introduction to Refrigeration and Refrigerants** • Historical development of refrigeration systems and applications in the maritime sector • Definition of refrigeration and heat pump concepts • Classification of refrigerants: CFCs, HCFCs, HFCs, natural refrigerants (NH_3, CO_2, hydrocarbons) • Environmental and safety considerations: ODP, GWP, Montreal and Kyoto Protocols
3	**Marine Refrigeration Systems** • Marine applications of refrigeration: cold storage rooms, reefer holds, refrigerated containers • Comparison between land-based and ship-based refrigeration • Structural and operational differences in marine refrigeration plants • Auxiliary systems and integration with ship power systems
4	**Elements of Refrigeration Systems** • Major components: evaporator, condenser, compressor, expansion devices • Auxiliary equipment: receivers, filters, oil separators, solenoid valves • Instrumentation and safety devices in refrigeration plants • Maintenance and classification requirements for shipboard refrigeration
5	**Compressors: Types and Working Principles** • Reciprocating, rotary, screw, and centrifugal compressors • Working cycles and control mechanisms • Performance characteristics, lubrication, and failure modes • Marine-specific operational considerations
6	**Operation of Refrigerators and Performance Analysis** • P-h (Pressure-Enthalpy) and T-s (Temperature-Entropy) diagrams • Subcooling, superheating, and their impact on performance • Refrigeration capacity calculations and energy efficiency optimization • Refrigeration room design and insulation requirements
7	**Troubleshooting in Refrigeration Systems** • Common faults: refrigerant leakage, compressor failure, abnormal pressures, icing in evaporators • Systematic fault detection methods • Case studies on shipboard refrigeration failures • Preventive maintenance and PMS (Planned Maintenance Systems)
8	**Midterm Exam & Practical Case Studies**

	• Written midterm covering thermodynamic principles and system components • Practical case study: Failure diagnosis and troubleshooting simulation
9	**Reefer Containers and Container Ship Cooling Systems** • Structure and function of reefer containers • Power supply and monitoring systems on container ships • Remote monitoring and alarm management • Cold chain management and cargo preservation standards
10	**Air Conditioning Fundamentals** • Principles of air conditioning and psychrometrics • Comfort conditions: temperature, humidity, air velocity, air quality • Processes on psychrometric chart: heating, cooling, humidification, dehumidification • Basic HVAC system designs
11	**Air Conditioning for Engine Rooms** • Heat loads in machinery spaces • Engine room ventilation and cooling requirements • Design and operational aspects of engine room HVAC • Fire safety integration: dampers, smoke control systems
12	**Air Conditioning for Accommodation Spaces** • Comfort air conditioning design for crew/passenger areas • Ventilation, filtration, and air distribution systems • IMO, SOLAS, and MARPOL requirements for accommodation ventilation • Case studies on ship HVAC failures
13	**Moisture and Psychrometric Parameters** • Definitions of specific humidity, relative humidity, and dew point temperature • Condensation problems and prevention in marine environments • Humidity control for cargo preservation and accommodation comfort • Practical psychrometric calculations
14	**LNG and LPG Vessels Cargo Refrigeration Systems** • Cryogenic properties of LNG and LPG cargoes • Cargo containment systems and reliquefication technologies • Boil-off gas (BOG) management and safety issues • Case study: LNG carrier refrigeration systems
15	**Final Exam & Course Wrap-up** • Final examination (theory + case analysis) • Review of refrigeration and air conditioning principles • Evaluation of current industry developments: low-GWP refrigerants, energy efficiency, and digital monitoring

Methods and Techniques Used in the Course

Lectures and Presentations

Theoretical concepts are delivered through structured lectures supported by visual presentations (PowerPoint, diagrams, animations, and thermodynamic cycle charts).

Case Studies and Problem-Solving Sessions

Real-life examples from marine refrigeration and air conditioning operations (e.g., reefer container cooling, LNG/LPG cargo systems) are discussed to enhance analytical and decision-making skills.

Practical Demonstrations / Laboratory Applications

Students are exposed to the operational aspects of refrigeration and air conditioning systems through laboratory simulations, equipment models, and, where possible, shipboard training or virtual labs.

Group Discussions and Seminars

Interactive classroom discussions on current practices, troubleshooting methods, and regulatory frameworks to encourage critical thinking and collaborative learning.

Technical Drawing and Cycle Analysis

Hands-on activities include P-h diagrams, T-s diagrams, psychrometric charts, and cycle efficiency calculations to strengthen technical understanding.

Assignments and Reports

Students prepare assignments on topics such as refrigerant selection, compressor efficiency, and environmental impact assessments.

Use of Multimedia and Digital Tools

Videos, simulation software, and online platforms are integrated to visualize complex processes like supercharging, turbocharging, and refrigeration cycle performance.

Exams and Quizzes

Mid-term and final exams, complemented by short quizzes, are used to evaluate theoretical and practical knowledge.

Independent Learning and Research

Students are encouraged to follow IMO, MARPOL, and international HVAC standards, engaging in research that strengthens professional awareness.

Sample Questions

Theoretical Questions

- Define the principle of refrigeration and explain how the reversed Carnot cycle forms the basis of refrigeration systems.
- Discuss the environmental impacts of commonly used refrigerants and explain the significance of MARPOL Annex VI regulations in marine applications.
- Compare and contrast the working principles of reciprocating and screw compressors. What are their advantages and limitations in marine refrigeration systems?
- Explain the role of psychrometric charts in air conditioning design. How do specific humidity, relative humidity, and dew point temperature interact?
- Describe the importance of insulation in marine refrigeration rooms. What materials are typically used, and why?

Application / Calculation Questions

- A marine refrigeration system operates between an evaporator temperature of -10°C and a condenser temperature of 35°C. Calculate the coefficient of performance (COP) assuming it operates on an ideal vapor-compression cycle.
- Using a psychrometric chart, determine the relative humidity of air at 25°C with a specific humidity of 0.010 kg water/kg dry air.
- A reefer container must maintain a temperature of -20°C during a voyage. If the heat load is 12 kW, calculate the required refrigeration capacity and suggest a suitable compressor type.
- Given the P-h diagram of a refrigeration cycle, identify the main components and processes, and mark the points corresponding to evaporation, compression, condensation, and expansion.

Case Study / Practical Questions

- During an inspection on board a container ship, you notice that the reefer is not cooling properly. List the possible faults in the system and the troubleshooting steps you would take.
- An LNG carrier requires a specific cargo temperature during transportation. Explain how the refrigeration and insulation system works to maintain cargo conditions safely.
- What are the major safety precautions to be followed during the operation and maintenance of air conditioning systems in the engine room?

Materials Used in the Course

Textbooks and Reference Books

- Arora, C.P. *Refrigeration and Air Conditioning*. McGraw-Hill Education.
- Stoecker, W.F. & Jones, J.W. *Refrigeration and Air Conditioning*. McGraw-Hill.
- Dossat, R.J. & Horan, T.J. *Principles of Refrigeration*. Pearson.
- ASHRAE Handbook: *Fundamentals* (latest edition).

International Standards and Regulations

- IMO MARPOL Annex VI – Regulations for the Prevention of Air Pollution from Ships.
- ISO Standards for Refrigeration and Air Conditioning Systems.
- Classification Society Rules (Lloyd's Register, DNV, ABS, etc.) related to marine refrigeration and air conditioning systems.

Technical Documents and Manuals

- Manufacturer's operation and maintenance manuals for marine refrigeration and air conditioning systems.
- Technical data sheets for refrigerants, lubricants, and insulation materials.
- Troubleshooting guides and fault diagnostic charts for compressors, condensers, and evaporators.

Multimedia and Digital Tools

- Simulation software for refrigeration cycle analysis (e.g., CoolPack, EES).
- Psychrometric charts (digital and printed versions).
- Instructional videos demonstrating marine refrigeration and air conditioning system operations.

Onboard and Laboratory Equipment

- Refrigeration test rigs for cycle demonstration and performance measurement.
- Compressor, condenser, and evaporator training units.
- Measurement instruments (pressure gauges, thermocouples, flow meters, hygrometers).

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution						
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	2	3	3	2	3	2
PO2	2	3	3	3	3	3
PO3	1	2	3	2	2	2
PO4	1	2	3	3	2	2
PO5	2	1	3	2	3	2
PO6	1	2	3	2	2	2
PO7	1	1	2	2	2	2
PO8	1	1	2	2	2	3
PO9	1	1	1	1	1	2
PO10	1	2	2	3	2	3
PO11	2	1	2	2	2	2
PO12	2	1	2	2	2	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lectures, multimedia presentations, conceptual discussions	Midterm exam, quizzes
CLO2	Lectures, component demonstrations, system classification workshops	Midterm exam, quizzes, homework assignments
CLO3	Problem-solving sessions, thermodynamic cycle analysis exercises	Midterm exam, final exam, homework assignments
CLO4	Laboratory demonstrations, practical system assessments, troubleshooting activities	Lab reports, practical assessment, quizzes
CLO5	Case studies, regulation-based evaluation exercises, environmental impact analysis	Case study reports, midterm/final exam sections
CLO6	Practical applications, simulation work, performance evaluation activities	Final exam, project report, presentations

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**4**	**60**
Midterm Exam	**1**	**2**	**2**
Preparation for Midterm Exam	**1**	**6**	**6**
Final Exam	**1**	**2**	**2**
Preparation for Final Exam	**1**	**6**	**6**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Case Studies / Critical Thinking	-	-	-
Project Writing	-	-	-
Group Work	**2**	**4**	**8**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**2**	**4**	**8**
Assignment(s)/Homework/Class Works	**4**	**4**	**16**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**123**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	2	10
Field Work	2	10
Special Course Internship (Work Placement)	-	-
Homework/Assignments	4	20
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	-	-
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**10**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		

University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Gas Turbines and Turbo Machineries							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED410	IV	Spring	3	3	2	2	0
Course type: Compulsory Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	-	30	50
Course Venue and Time				Wednesday 09.30-12.20			
Instructor information				**Prof. Dr. Deniz Ünsalan** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4095 deniz.unsalan@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course provides students with a comprehensive understanding of the principles, design, operation, and applications of gas turbines and turbo machineries. Beginning with a review of ideal gas operations and thermodynamic cycles, the course explores the Brayton cycle and its modifications, including intercooling, reheating, regeneration, and advanced cycles such as the Cheng and Feher cycles. The theory of supersonic flow, nozzle performance, and impulse–reaction turbine analysis is introduced, followed by a detailed study of gas turbine components such as compressors, turbines, and combustion chambers. Special emphasis is placed on the application of gas turbines in marine propulsion systems, auxiliary systems, and power generation. The course also covers supercharging and turbocharging in internal combustion engines, including sequential and pressure-wave turbocharging, while linking theoretical knowledge to practical applications in marine and industrial systems. In the later weeks, students gain insight into maintenance practices, troubleshooting, and performance evaluation methods for turbo machinery. Through a combination of theoretical instruction and practical applications, the course equips students with the skills to analyze, operate, and manage gas turbine systems effectively, with particular emphasis on marine engineering contexts.
Course Aims and Objectives	The aim of this course is to provide students with a solid theoretical foundation and practical understanding of gas turbines and turbo machineries, with a special emphasis on their applications in marine and power generation systems. • Understand the fundamental thermodynamic principles governing gas turbine cycles and turbo machinery operations. • Analyze the Brayton cycle and its modifications to improve efficiency and performance under different operating conditions. • Examine the principles of supersonic flow, nozzle design, and turbine operation. • Identify and describe the main components of gas turbines, including compressors, turbines, and combustion chambers. • Explore the role of gas turbines in ship propulsion systems, auxiliary machinery, and power generation applications. • Understand the concepts of supercharging and turbocharging in internal combustion engines and their practical implementations. • Develop knowledge of advanced turbocharging methods such as sequential and pressure-wave supercharging. • Gain familiarity with routine maintenance, troubleshooting techniques, and performance evaluation of turbo machinery. • Apply theoretical and practical knowledge to solve engineering problems related to gas turbines in marine and industrial contexts. • Prepare students for professional practice by integrating theoretical analysis with hands-on problem-solving in gas turbine systems.

Course Learning Outcomes	**CLO1 – Thermodynamic Principles & Gas Turbine Cycles** Explain and analyze fundamental thermodynamic concepts related to gas turbines, including the ideal and real Brayton cycle and modified cycles such as intercooling, reheating, regeneration, Cheng, and Feher cycles. **CLO2 – Supersonic Flow & Turbine/Nozzle Theory** Apply supersonic flow principles, nozzle theories, and related thermodynamic relations to evaluate turbine design, expansion processes, and performance characteristics. **CLO3 – Gas Turbine Components & Operation** Identify, describe, and interpret the functions of major gas turbine components—radial/axial compressors, turbines, and combustion chambers—and evaluate their performance in marine propulsion and power systems. **CLO4 – Turbocharging & Supercharging Applications** Explain and apply turbocharging and supercharging principles for internal combustion engines, assessing their impact on efficiency, emissions, and overall system performance. **CLO5 – Maintenance, Troubleshooting & Performance Assessment** Perform routine maintenance, troubleshooting, and diagnostic procedures for gas turbines and turbo machinery, and conduct performance assessments using analytical and practical evaluation methods. **CLO6 – Practical Integration & Professional Competence** Integrate theoretical knowledge with practical engineering applications to solve marine and industrial problems involving gas turbine systems, demonstrating safe, efficient, and professionally competent operation.

Content of the Course

Week	*Subject*
1	Review of ideal gas operations (Constant pressure, Constant volume, Constant temperature, Constant entropy, Constant enthalpy/throttling operations)
2	Brayton cycle analysis, ideal and actual gas turbines
3	Modifications to Brayton cycle: a. Intercooling b. Re-heating c. Regeneration d. Steam injected Brayton cycle (Cheng cycle) e. Supercritical Carbon Dioxide cycle (Feher cycle)
4	Theory of supersonic flow and supersonic nozzles
5	Impulse and reaction turbine analysis
6	Parts of gas turbines: a. Radial and axial flow compressors b. Radial and axial flow turbines c. Combustion chambers
7	Applications of gas turbines to ship propulsion systems and power generation
8	Mid-Term Exam Application (where applicable)
9	Auxiliary systems of gas turbine power plants. Marine applications: Turbo generators and turbo-pumps
10	Theory of supercharging and turbocharging, gas exchange in four stroke and two stroke internal combustion engines
11	Analysis of turbocharging in Diesel and Otto engines, sequential turbocharging
12	Pressure-wave supercharging
13	Turbo-machinery routine maintenance
14	Trouble – shooting and performance evaluation methods
15	Final exam Application

Methods and Techniques Used in the Course

Lectures – Theoretical explanation of gas turbine thermodynamics, turbo-machinery principles, and cycle modifications.

Practical Applications / Laboratory Sessions – Hands-on exercises with gas turbine models, turbo-machinery components, and auxiliary systems to reinforce theoretical concepts.

Problem-Solving Sessions – Calculation-based exercises on Brayton cycle analysis, turbocharging, supercharging, and performance evaluation.

Case Studies – Analysis of real-world marine gas turbine installations, turbo generators, and propulsion systems to develop practical decision-making skills.

Simulation Exercises – Use of software tools to model gas turbine performance, analyze supersonic flow, and evaluate different cycle modifications.

Group Discussions and Team Work – Collaborative exercises on troubleshooting, maintenance planning, and performance improvement of turbo-machinery systems.

Mid-Term and Final Exams – Assessment of understanding through theoretical and applied questions covering all course topics.

Reports and Assignments – Analysis of specific turbo machinery problems, maintenance planning, and operational performance evaluation.

Demonstrations – Instructor-led demonstrations of turbine components, auxiliary systems, and operational procedures.

Feedback and Q&A Sessions – Continuous interaction between students and instructors to clarify concepts and correct misunderstandings.

Sample Questions

Thermodynamics and Cycles

- Explain the differences between the ideal and actual Brayton cycle.
- Calculate the thermal efficiency of a gas turbine operating on a reheat Brayton cycle given the inlet and outlet temperatures and pressures.
- Discuss the advantages and limitations of using steam injection in a Brayton cycle.

Turbo-Machinery Components

- Compare radial and axial flow compressors in terms of efficiency, pressure ratio, and typical marine applications.
- Describe the main components of a marine gas turbine and their functions.
- Explain the working principle of impulse vs. reaction turbines.

Gas Turbine Applications

- Discuss the use of gas turbines in ship propulsion and power generation.
- Identify the auxiliary systems of a marine gas turbine power plant and explain their importance.
- Explain the concept of turbocharging in Diesel engines and how sequential turbocharging improves performance.

Supercharging and Pressure Waves

- Analyze the role of pressure-wave superchargers in improving engine efficiency.
- Compare supercharging and turbocharging methods for a two-stroke marine engine.

Performance Evaluation and Maintenance

- Outline a procedure for routine maintenance of a marine gas turbine.
- Discuss troubleshooting methods for a gas turbine experiencing reduced power output.
- Evaluate performance data of a turbo-generator to identify potential issues.

Problem-Solving / Numerical Questions

- Given pressure and temperature data, calculate the work output and efficiency of an axial-flow turbine stage.
- Determine the effect of intercooling on the efficiency of a modified Brayton cycle.
- Compute the mass flow rate of air required for a gas turbine to produce a given power output under specific operating conditions.

Materials Used in the Course

Textbooks and Reference Books:

- **"Gas Turbine Theory"** – H. Cohen, G. Rogers, H. Saravanamuttoo
- **"Marine Gas Turbines and Applications"** – J. Carlton
- **"Thermodynamics: An Engineering Approach"** – Yunus A. Çengel, Michael A. Boles
- **"Turbo-Machinery: Design and Theory"** – William W. Parrish
- **"Internal Combustion Engines for Marine Applications"** – B. Turner

Academic Journals and Articles:

- Journal of Marine Engineering & Technology
- Journal of Turbomachinery (ASME)
- Applied Thermal Engineering (Gas Turbine Sections)

Software and Simulation Tools:

- Gas turbine simulation software (e.g., **MATLAB/Simulink**, **GSP – Gas Turbine Simulation Program**)
- Thermodynamic cycle calculators
- Turbo-machinery design and performance analysis software

Laboratory and Practical Equipment:

- Gas turbine test rigs
- Turbocharger and supercharger demonstration units
- Axial and radial flow turbine models
- Combustion chamber and fuel injection system models
- Sensors and measurement devices for pressure, temperature, and flow rate

Supporting Materials:

- Lecture slides and notes
- Case studies on marine gas turbine applications
- Maintenance manuals of marine gas turbines
- Performance evaluation charts and troubleshooting guides

All the above listed books are available at UoK's Grand Library

Program Outcomes Matrix

	Program Outcomes	*Level of Contribution				Targeted Competence Areas
		0	1	2	3	
1	Demonstrate comprehensive knowledge of marine engineering principles, systems, and machinery operations, and effectively apply this knowledge to ensure safe, efficient, and sustainable vessel performance in compliance with IMO and STCW standards.				✓	Technical Knowledge & Applied Sciences
2	Apply advanced engineering design principles to develop, adapt, and optimize mechanical, electrical, and control systems onboard ships and in shore-based industrial contexts, integrating safety, cost-efficiency, and environmental considerations.				✓	Analytical & Computational Skills
3	Perform engineering watchkeeping duties and operational management with professional responsibility, situational awareness, and adherence to international maritime conventions and best practices.				✓	Sustainable Design & Safe Operating
4	Identify, formulate, and analyze complex engineering problems using appropriate theoretical, computational, and experimental techniques to derive sound, data-driven solutions in marine and related engineering domains.			✓		Research & Experimentation
5	Integrate principles of safety culture, risk assessment, and environmental protection into all engineering practices, promoting sustainable operations aligned with IMO conventions such as MARPOL and SOLAS.			✓		Innovation & Digital Competence
6	Employ advanced digital tools, diagnostic systems, and automation technologies for monitoring, control, and performance assessment of marine and industrial systems, in line with the requirements of the evolving maritime digitalization era.				✓	Regulatory Frameworks & Safety
7	Demonstrate competence in planning, executing, and managing engineering projects, including resource allocation, budgeting, and maintenance planning, while ensuring quality, safety, and compliance with regulatory frameworks.				✓	Teamwork & Leadership
8	Function effectively as a leader and member of multidisciplinary and multicultural teams, fostering collaboration, ethical conduct, and efficient communication in dynamic and often high-stress maritime environments.				✓	Project Management & Entrepreneurship
9	Communicate effectively in both written and oral forms with clarity, professionalism, and technical precision in English and other relevant languages within maritime and industrial contexts.			✓		Ethics & Professionalism
10	Adhere to the ethical and professional standards of the engineering and maritime professions, demonstrating accountability, integrity, and a commitment to continuous professional development and lifelong learning.				✓	Lifelong Learning & Adaptability
11	Evaluate and implement sustainable engineering practices and emerging green technologies to minimize the environmental footprint of marine and industrial operations.			✓		Communication Competence
12	Exhibit the flexibility and interdisciplinary mindset required to transfer marine engineering knowledge and skills to diverse sectors, contributing effectively to innovation and technological advancement beyond the maritime industry.			✓		Global Vision & Societal Impact

***0:** No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Program Outcomes /Course Learning Outcomes Matrix **Level of Contribution**:**0**-No Contribution **1**-Little Contribution **2**-Partial Contribution **3**-Full Contribution						
PO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	3	2	2	2	3	2
PO2	3	3	3	2	3	3
PO3	2	2	3	2	2	2
PO4	1	2	2	2	2	2
PO5	2	1	1	1	2	2
PO6	1	1	2	1	1	2
PO7	1	1	1	1	1	2
PO8	1	1	1	1	1	2
PO9	1	1	1	1	1	1
PO10	2	2	3	2	2	3
PO11	2	1	1	1	1	2
PO12	3	1	1	1	1	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lectures, multimedia presentations, theoretical instruction	Midterm exam, quizzes, written assignments
CLO2	Problem-solving sessions, board work, guided examples	Midterm exam, quizzes, homework exercises
CLO3	Laboratory demonstrations, simulation software, practical case studies	Lab reports, practical exams, performance assessment
CLO4	Tutorials, computational analysis, group activities	Problem-solving exam, project work, homework
CLO5	Applied workshops, technical demonstrations, industry-relevant tasks	Final exam, project evaluation, technical reports
CLO6	Team-based learning, presentations, integrated problem-solving activities	Presentations, group project, continuous assessment

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**4**	**60**
Midterm Exam	**1**	**3**	**3**
Preparation for Midterm Exam	**1**	**6**	**6**
Final Exam	**1**	**3**	**3**
Preparation for Final Exam	**1**	**6**	**6**
Presentation(s)	-	-	-
Preparation for Presentation(s)	-	-	-
Case Studies / Critical Thinking	-	-	-
Project Writing	**1**	**3**	**3**
Group Work	**1**	**3**	**3**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	-	-	-
Assignment(s)/Homework/Class Works	**2**	**3**	**6**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**105**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	1	10
Special Course Internship (Work Placement)	-	-
Homework/Assignments	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	1	10
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	40
Total	**6**	**100**

	Percentage	**Course Grade**	**Coefficient**
Grading Policy	90-100	AA	4.0
	85-89	BA	3.5
	80-84	BB	3.0
	75-79	CB	2.5
	70-74	CC	2.0
	60-69	DC	1.5
	50-59	DD	1.0
	49 and below	FF	0.0
	Less than 70% attendance	NA	-
Course Requirements and Policies	• Alerted attendance at the lectures is essential! • Students are expected to check frequently the instructor's web page for the course announcements. • University of Kyrenia honor code will be strictly enforced regarding any issues concerning cheating.		