University of Kyrenia

Faculty of Maritime Studies

Marine Engineering

Syllabus

Course name: Computer-Aided Design (CAD)							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
AER209	IV	Fall	3	3	2	2	0
Course type: Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	20	30	30
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 course *Computer-Aided Design (CAD)* provides students with comprehensive knowledge and practical skills in modern computer-based design methods used in engineering and technical fields. It introduces the fundamental principles of CAD software, focusing on both 2D drafting and 3D modeling techniques. Students will begin with the installation of CAD software and navigation of the user interface, followed by customization of workspaces to enhance productivity. Key concepts such as layer management, dimension styles, and drawing tools will be covered in detail. The course emphasizes hands-on experience through structured 2D drawing exercises, enabling students to apply theoretical concepts in practical scenarios. The course then progresses to advanced 3D modeling techniques, including solid and mesh modeling, editing, coordinate systems, and section planes. Students will learn to convert 2D drawings into 3D models and apply modeling tools to create accurate, functional designs suitable for engineering applications. Additionally, the course introduces the integration of CAD with CAM (Computer-Aided Manufacturing) software, highlighting workflow optimization from design to production. A field trip to the Near East University Robotics Lab provides students with exposure to real-world CAD/CAM applications and industrial robotics systems. By the end of the course, students will have acquired the skills to produce precise 2D and 3D models, understand best practices in CAD design, and bridge the gap between computer-aided design and manufacturing processes.
Course Aims and Objectives	The aim of this course is to equip students with both theoretical understanding and practical skills in computer-aided design (CAD) systems. The course seeks to develop proficiency in creating, modifying, and managing 2D and 3D digital models for engineering applications. Additionally, it introduces the integration of CAD with CAM software to prepare students for modern manufacturing and design workflows. • Understand the fundamentals of CAD software, including user interface, customization, and workspace management. • Apply 2D drafting techniques to create precise technical drawings and engineering schematics. • Manage layers, dimensions, and annotation styles for professional and accurate design documentation. • Develop 3D models from 2D drawings, utilizing solid, surface, and mesh modeling techniques. • Perform advanced editing, view manipulation, and sectioning in 3D CAD environments. • Convert design concepts into models suitable for computer-aided manufacturing (CAM). • Understand the workflow integration between CAD and CAM systems for practical engineering applications. • Analyze and solve design problems using CAD tools to meet engineering specifications and standards. • Gain practical exposure to industrial applications through laboratory exercises and field experiences.

Course Learning Outcomes	**CLO1:** Demonstrate proficiency in CAD software by navigating the user interface, customizing workspaces, and managing project files effectively. **CLO2:** Produce accurate 2D technical drawings using appropriate drawing and modification tools, including line, arc, circle, and polyline commands, and apply proper annotation and dimensioning techniques. **CLO3:** Create complex 3D models from 2D sketches using solid, surface, and mesh modeling techniques, and perform conversions between 2D and 3D models efficiently. **CLO4:** Manipulate and analyze 3D models through view controls, section planes, and coordinate systems for better visualization, assessment, and error detection. **CLO5:** Integrate CAD models with CAM software to prepare designs for practical manufacturing processes, and evaluate design models for manufacturability and compliance with technical standards. **CLO6:** Apply CAD knowledge in real-world contexts through lab exercises, field visits, and industrial examples, solving engineering design problems while demonstrating readiness for professional practice.

Content of the Course

Week	*Subject*
1	Installing CAD and introducing user interface
2	Customizing CAD workspace
3	Layer properties and dimension styles
4	Drawing tools
5	Modifying tools
6	Performing 2D drawing exercises
7	Performing 2D drawing exercises
8	Mid-term Exam
9	Converting 2D models to 3D models
10	3D modelling- user interface, view options, section planes and coordinate system
11	3D modelling- Mesh, drawing and solid editing
12	3D modelling exercises
13	Transition from CAD to CAM software
14	CAM software and Field trip to Near Eat University Robotics Lab
15	Final Exams

Methods and Techniques Used in the Course

Lectures and Demonstrations:

- Instructor-led presentations introducing CAD concepts, commands, and workflows.
- Live demonstrations of 2D and 3D modeling techniques.

Hands-On Lab Exercises:

- Step-by-step practice on 2D drafting, modification, annotation, and dimensioning.
- 3D modeling exercises including solid, surface, and mesh modeling.

Project-Based Learning:

- Individual or group projects requiring the creation of complete CAD models.
- Conversion of 2D sketches to fully functional 3D models.

Computer-Aided Manufacturing (CAM) Integration:

- Introduction to CAM software and its interaction with CAD models.
- Exercises on preparing CAD designs for manufacturing simulations.

Field Visits and Case Studies:

- Industrial field trip to observe real-world CAD/CAM applications.
- Case studies analyzing engineering drawings and designs for practical applications.

Problem-Solving and Troubleshooting:

- Identifying and correcting modeling errors.
- Optimizing designs for manufacturability and efficiency.

Assessment and Feedback:

- Quizzes and assignments for immediate evaluation of skill acquisition.
- Instructor feedback on project accuracy, creativity, and adherence to technical standards.

Sample Questions

Conceptual Questions

- Explain the difference between 2D drafting and 3D modeling in CAD software.
- Describe the role of layers, line types, and dimension styles in creating a professional CAD drawing.
- Discuss the advantages of integrating CAD models with CAM systems in modern manufacturing.

Practical/Hands-On Questions

- Create a 2D floor plan with correct layer management, dimensioning, and annotations.
- Convert a 2D mechanical part sketch into a 3D solid model, applying extrusion and fillet features.
- Modify an existing 3D model by adding holes, chamfers, and surface details according to specified dimensions.

Problem-Solving Questions

- Identify errors in a given 2D CAD drawing and suggest corrections.
- Optimize a 3D model for manufacturability, reducing unnecessary complexity while maintaining design integrity.
- Simulate a basic CAM process using a CAD model, explaining the selection of tool paths and operations.

Case Study / Analysis Questions

- Analyze a complex CAD assembly and identify potential clashes or misalignments.
- Evaluate a design created by CAD software and propose improvements for ergonomics or functionality.

Theory-Application Integration

- Explain how coordinate systems and reference planes are used to create accurate 3D models.
- Discuss the importance of mesh editing and solid modeling techniques for engineering applications.

Materials Used in the Course

Textbooks and Reference Books

- **"Engineering Drawing and Design"** by David A. Madsen – for fundamental CAD principles and 2D/3D drawing techniques.
- **"Mastering AutoCAD 2024 and AutoCAD LT 2024"** by Brian C. Benton – practical guide for CAD tools, commands, and exercises.
- **"Introduction to CAD/CAM"** by Chris McMahon – provides insights into CAD-CAM integration and manufacturing applications.
- **"Mechanical Design Engineering Handbook"** by Peter R. N. Childs – reference for mechanical design principles applied in CAD.

Software

- **AutoCAD** – for 2D drafting, dimensioning, and layer management.
- **SolidWorks / Autodesk Inventor / Fusion 360** – for 3D modeling, solid and mesh editing, and simulation exercises.
- **CAM Software (Mastercam / Fusion 360 CAM)** – for CAD-to-CAM integration and basic manufacturing simulations.

Hardware

- Desktop or laptop computers with adequate GPU and CPU for 3D modeling and rendering.
- High-resolution monitors for precise drafting and modeling.
- 3D mouse or CAD input devices (optional, for advanced modeling).

Supplementary Materials

- Online tutorials and video demonstrations (e.g., LinkedIn Learning, YouTube, or Coursera CAD modules).
- Lecture slides and course notes prepared by the instructor.
- Sample CAD models and exercises for in-class and homework assignments.
- Access to CAD labs or institutional robotics and CAM labs for practical sessions.

Assessment & Practice Tools

- Pre-prepared 2D/3D exercises for skill assessment.
- Digital handouts for layer management, dimensioning standards, and 3D modeling techniques.
- Quizzes and mid-term/final project guidelines for applied 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	3	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Demonstration, Hands-on CAD Lab	Practical Exercises, Quizzes, Project File Submission
CLO2	Hands-on CAD Lab, Guided Exercises	2D Drawing Assignments, Peer Review, Quizzes
CLO3	CAD Lab, Interactive Tutorials	3D Modeling Assignments, Lab Reports
CLO4	CAD Lab, Visualization Exercises	Model Analysis Reports, Practical Exams
CLO5	CAD-CAM Integration Lab, Case Studies	CAM Simulation Assignments, Design Evaluation Reports
CLO6	Industrial Visits, Project-Based Learning, Lab Exercises	Capstone Project, Final Exam, Presentation

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	-	-	-
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	**1**	**8**	**8**
Group Work	-	-	-
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**4**	**4**	**16**
Assignment(s)/Homework/Class Works	**2**	**4**	**8**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**108**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	4	20
Field Work	-	-
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	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: Computer-Aided Design (CAD)							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
AER209	IV	Fall	3	3	2	2	0
Course type: Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	20	30	30
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	This course introduces the fundamental principles of economics as applied to engineering decision-making. It covers cost concepts, the economic environment, and the relationships between price and demand, including competition analysis. Students examine make-versus-buy decisions, time value of money, depreciation, and banking principles. The course also explores price changes, inflation, and financial management within businesses and engineering projects. Emphasis is placed on applying economic analysis to practical engineering scenarios to support informed decision-making, optimize resource allocation, and evaluate the financial feasibility of engineering solutions.
Course Aims and Objectives	The aim of this course is to provide engineering students with the fundamental economic principles and analytical tools necessary for making informed engineering and business decisions. The course focuses on integrating economic reasoning into engineering practices and understanding the financial and market factors affecting projects and organizations. • Understand the economic environment and its impact on engineering decision-making. • Apply cost concepts to evaluate engineering projects and production processes. • Analyze price, demand, and competition relationships in engineering markets. • Conduct make-versus-buy studies and other investment evaluations. • Apply the principles of time value of money, depreciation, and financing in engineering contexts. • Assess the effects of price changes, inflation, and monetary factors on engineering projects. • Integrate economic analysis into business and project financial management. • Make informed decisions regarding engineering investments, project feasibility, and resource allocation. • Understand banking and financial systems relevant to engineering enterprises. • Apply economic reasoning to solve real-world engineering and business problems efficiently.
Course Learning Outcomes	**CLO1:** Explain fundamental economic principles and their application to engineering decision-making. **CLO2:** Analyze cost concepts and apply them to evaluate engineering projects and production processes. **CLO3:** Examine price, demand, and competition relationships in engineering markets. **CLO4:** Conduct make-versus-buy studies and assess investment alternatives using economic analysis. **CLO5:** Apply the principles of time value of money, depreciation, and financial evaluation in engineering contexts. **CLO6:** Evaluate the effects of price changes, inflation, and monetary factors on engineering projects and organizational decisions.

Content of the Course

Week	*Subject*
1	Introduction to Economics for Engineers: Scope and Importance
2	Principles of Economic Decision-Making in Engineering
3	Cost Concepts: Fixed, Variable, and Total Costs
4	Economic Environment and Market Analysis
5	Price and Demand Relationships in Engineering Projects
6	Competition Analysis and Market Structures
7	Make-versus-Buy Studies and Investment Decisions
8	Midterm Exam Week
9	Time Value of Money and Discounting Principles
10	Depreciation Methods and Applications in Engineering Projects
11	Principles and Applications of Banking for Engineers
12	Price Changes, Inflation, and Economic Impacts on Projects
13	Business and Company Finance in Engineering Contexts
14	Case Studies and Practical Applications of Economics
15	Final Exam

Methods and Techniques Used in the Course

Lectures: Presentation of core economic principles, cost concepts, and financial analysis techniques for engineering applications.

Case Studies: Analysis of real-world engineering and business scenarios to apply economic decision-making.

Problem-Solving Exercises: Application of time value of money, make-versus-buy studies, and cost analysis to practical engineering problems.

Group Discussions: Interactive sessions to evaluate economic environments, competition, and project feasibility.

In-Class Activities: Workshops on pricing, demand estimation, and financial evaluation techniques.

Homework Assignments: Exercises focused on cost calculations, investment decisions, and economic modeling.

Quizzes and Exams: Periodic assessments to measure understanding of economic principles and their application in engineering contexts.

Software and Tools (if applicable): Introduction to spreadsheets and financial calculators for economic analysis.

Sample Questions

1. Economic Principles and Decision-Making

- Explain the role of economics in engineering decision-making.
- How does the economic environment influence engineering project choices?

2. Cost Concepts

- Differentiate between fixed, variable, and total costs in an engineering project.
- A project has fixed costs of $50,000 and variable costs of $20 per unit. Calculate the total cost for producing 1,000 units.

3. Price, Demand, and Competition

- Analyze how price changes affect the demand for an engineering product.
- Explain the impact of market competition on project feasibility and pricing.

4. Make-versus-Buy Studies

- Conduct a make-versus-buy analysis for a component needed in a manufacturing process.
- Discuss factors that should be considered in make-versus-buy decisions.

5. Time Value of Money and Depreciation

- Calculate the present value of $10,000 to be received in 3 years at an interest rate of 8%.
- Compare straight-line and declining balance depreciation methods for a piece of equipment costing $50,000.

6. Inflation and Financial Impacts

- Explain how inflation affects engineering project costs and financial planning.
- Discuss the importance of banking and financing principles in evaluating project investments.

Materials Used in the Course

Primary Textbooks

- **Samuelson, P. A., & Nordhaus, W. D. (2010).** ***Economics*** **(19th Edition).** McGraw-Hill.
- **Hirschey, M., & Pappas, J. L. (2013).** ***Managerial Economics*** **(12th Edition).** Cengage Learning.
- **Garrison, R. H., Noreen, E. W., & Brewer, P. C. (2021).** ***Managerial Accounting*** **(16th Edition).** McGraw-Hill.

Recommended References

- **Chiang, A. C., & Wainwright, K. (2005).** ***Fundamental Methods of Mathematical Economics*** **(4th Edition).** McGraw-Hill.
- **Van Horne, J. C., & Wachowicz, J. M. (2008).** ***Fundamentals of Financial Management*** **(13th Edition).** Pearson.
- **Varian, H. R. (2014).** ***Intermediate Microeconomics: A Modern Approach*** **(9th Edition).** W.W. Norton & Company.
- **Tucker, I. B. (2014).** ***Microeconomics for Today*** **(9th Edition).** Cengage Learning.

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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 / CLO	**CLO1**	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**
PO1	3	3	2	3	2	3
PO2	3	3	3	3	2	3
PO3	2	2	2	2	2	2
PO4	2	2	2	2	2	2
PO5	1	2	2	2	2	2
PO6	1	2	2	2	2	2
PO7	1	2	2	2	2	2
PO8	1	1	2	1	2	2
PO9	1	1	2	1	1	2
PO10	2	2	2	2	2	2
PO11	1	2	2	2	2	2
PO12	1	2	1	2	2	2

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1. Explain fundamental economic principles and their application to engineering decision-making	Lectures, interactive discussions, case study analysis	Quizzes, midterm exam, assignments
CLO2. Analyze cost concepts and apply them to evaluate engineering projects and production processes	Problem-solving exercises, workshops, practical examples	Assignments, homework, midterm exam
CLO3. Examine price, demand, and competition relationships in engineering markets	Lectures, market analysis exercises, group discussions	Quizzes, case study assignments, midterm exam
CLO4. Conduct make-versus-buy studies and assess investment alternatives using economic analysis	Group exercises, scenario-based problem solving, lectures	Assignment reports, practical exercises, midterm exam
CLO5. Apply the principles of time value of money, depreciation, and financial evaluation in engineering contexts	Lectures, workshops, spreadsheet exercises	Quizzes, homework, midterm and final exam
CLO6. Evaluate the effects of price changes, inflation, and monetary factors on engineering projects and organizational decisions	Case studies, interactive problem-solving, lectures	Assignments, case study analysis, final exam

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	-	-	-
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	**1**	**8**	**8**
Group Work	-	-	-
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**4**	**4**	**16**
Assignment(s)/Homework/Class Works	**2**	**4**	**8**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**108**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	4	20
Field Work	-	-
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	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: Maritime Law and Conventions II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
LAW401	IV	Fall	4	4	4	0	0
Course type: Compulsory				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Fundamental Legal Knowledge (Core)**	**Legal Method & Reasoning**	**Legal Skills (Research & Writing)**	**General Education**
				60%	20%	10%	10%
Course Venue and Time				E - 6007 (15:30 – 18:20)			
Instructor information				**Lect. Halil Emre Gürler** Faculty of Law halilemre.gurler@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course provides an in-depth study of **Maritime Law and International Conventions**, with a particular focus on both **public and private maritime law**. It examines the legal status of ships, ship registration, seaworthiness, and the roles, rights, and responsibilities of masters and shipowners. The course further explores charter parties, freight contracts, and liabilities arising from maritime accidents such as collisions, salvage, and general average. In addition, students will analyze **national maritime legislation**, including cabotage, labor, port, customs, and health regulations, and their impact on maritime operations. A substantial part of the course is dedicated to the study of **major international maritime conventions** such as SOLAS, MARPOL, Load Lines, MLC 2006, and related IMO instruments, focusing on their legal requirements, implementation, and enforcement. Through a comparative and practical approach, this course aims to equip students with a comprehensive understanding of the **legal framework governing maritime activities**, preparing them to address contemporary challenges in both national and international contexts.
Course Aims and Objectives	The primary aim of this course is to provide students with a comprehensive understanding of the fundamental principles, rules, and practices of **maritime law** within both national and international frameworks. It seeks to develop students' ability to analyze legal concepts related to ships, masters, shipowners, cargo, charter parties, and maritime accidents, while also familiarizing them with the implementation of **international maritime conventions**. • Understand the scope, sources, and branches of maritime law, including both public and private maritime law. • Examine the legal status, registration, and seaworthiness requirements of ships, as well as the documents and records required onboard. • Analyze the authority, rights, and responsibilities of shipmasters and shipowners under national and international law. • Explore different types of charter parties, freight contracts, bills of lading, and their legal implications. • Evaluate liabilities and procedures concerning maritime accidents, including collisions, salvage, and general and particular average. • Gain knowledge of national maritime legislation, including cabotage, port regulations, customs, and health-related requirements. • Study the structure, content, and enforcement of major international maritime conventions such as SOLAS, MARPOL, Load Lines, UNCLOS, and MLC 2006.

	• Develop the ability to apply international maritime conventions and national regulations to practical case scenarios. • Strengthening their legal reasoning and problem-solving skills in matters related to maritime law and compliance.
Course Learning Outcomes	**CLO1: Define and explain** the scope, sources, and fundamental principles of maritime law, including its public and private branches. **CLO2: Identify and evaluate** the legal status, registration, and seaworthiness of ships, as well as the documents and certificates required onboard. **CLO3: Analyze** the authority, duties, and responsibilities of shipmasters and shipowners under both public and private maritime law. **CLO4: Interpret and apply** the legal framework of charter parties, bills of lading, and freight contracts, including their types, termination, and liabilities. **CLO5: Assess** the causes, consequences, and legal procedures of maritime accidents, including collisions, salvage, general average, and particular average. **CLO6: Discuss** the key elements of national maritime legislation, including cabotage, port regulations, customs law, health regulations, and seafarers' rights. **CLO7: Explain** the structure, objectives, and enforcement mechanisms of major international maritime conventions such as SOLAS, MARPOL, Load Lines, UNCLOS, STCW, and MLC 2006. **CLO8: Demonstrate** an understanding of the legal responsibilities for ensuring safety of life at sea and prevention of marine pollution. **CLO9: Apply** maritime law principles and international conventions to practical case studies and problem-solving exercises. **CLO10: Develop** legal reasoning, analytical thinking, and communication skills necessary for handling maritime legal issues in professional practice.

Content of the Course

Week	*Subject*
1	**Introduction to Maritime Law** Definition, Scope, and Branches
2	**Public Maritime Law** Definition, Scope, and Subdivisions
3	**Private Maritime Law** Definition, Scope, and Subdivisions
4	**The Ship in Maritime Law:** • Definition and Legal Status of Ships • Ship Registration and Flag State Rights
5	**Seaworthiness and Ship Requirements:** • Fitness for Voyage, Cargo, and Safety • Ship Surveys and Measurements • Safety Regulations for Life and Property at Sea
6	**Ship Documentation and Legal Instruments:** • Ship Certificates and Records (Logbooks, Tonnage Certificates, Ship's Papers) • Bills of Lading and Sea Protest
7	**The Master of the Ship:** • Legal Definition and Authority of the Master • Public and Private Law Responsibilities • Disciplinary Powers and Duties in Case of Offenses
8	**The Shipowner (Donatan):** • Definition, Rights, and Liabilities of the Shipowner
9	**Charter Parties and Freight Contracts:** • Types and Legal Nature of Charter Parties • Responsibilities of Parties • Laytime and Demurrage • Bills of Lading • Termination of Freight Contracts
10	**Maritime Accidents:** • Collisions at Sea • Sea Protest Procedures • General and Particular Average • Salvage and Assistance
11	**National Maritime Legislation:** • Cabotage Law • Maritime Labor Law • Laws on Seizure and Confiscation at Sea • Penal Codes and Criminal Procedures Related to Maritime Matters

12	**National Maritime Legislation:** • Cabotage Law • Maritime Labor Law • Laws on Seizure and Confiscation at Sea • Penal Codes and Criminal Procedures Related to Maritime Matters
13	**International Maritime Conventions:** • Ship Certification and Documentation under IMO Conventions • Load Line Convention (LL 1966/1988) • SOLAS (Safety of Life at Sea) Convention
14	**International Maritime Conventions:** • Ship Certification and Documentation under IMO Conventions • Load Line Convention (LL 1966/1988) • SOLAS (Safety of Life at Sea) Convention
15	**Contemporary Issues in Maritime Law and Conventions:** • National Implementation of International Conventions • Responsibilities of Ship, Crew, Cargo, and Passenger Safety under International Law • Methods and Practices for Preventing Marine Pollution

Methods and Techniques used in the Course

Lectures and Presentations: Instructor-led theoretical sessions supported with visual materials and case examples.

Classroom Discussions: Interactive discussions to encourage critical thinking and deeper understanding of maritime legal issues.

Case Study Analysis: Examination of real-life maritime incidents, accidents, and disputes to apply relevant conventions and legal principles.

Document and Convention Review: Practical exercises on reading, interpreting, and analyzing international conventions, ship documents, and legal texts.

Problem-Solving Exercises: Scenario-based activities requiring application of maritime law to operational and legal problems.

Group Work and Presentations: Collaborative tasks where students prepare and present analyses of selected maritime law topics.

Simulation and Role-Play: Mock legal or operational exercises (e.g., collision responsibility, salvage agreement, or port authority inspection) to practice real-world applications.

Use of Maritime English Terminology: Emphasis on practicing and applying specialized English vocabulary in written and oral form.

Independent Study and Research: Assignments and projects requiring students to explore maritime legal resources, conventions, and academic literature.

Sample Questions

Short Answer Questions

- Define the distinction between public maritime law and private maritime law, giving one example of each.
- What is meant by the "seaworthiness" of a ship, and why is it a critical legal requirement?
- Explain the legal authority and responsibilities of a shipmaster in the event of a maritime accident.
- What are the main differences between a charter party and a bill of lading?
- Briefly explain the concept of *general average* and provide one example.

Essay Questions

- Discuss the role and responsibilities of shipowners (donatans) under maritime law. How are their rights and liabilities defined in national and international frameworks?
- Analyze the importance of SOLAS and MARPOL conventions in ensuring maritime safety and environmental protection. Provide real-world examples of their implementation.
- Evaluate the legal implications of a collision at sea. How are liability and compensation determined under international conventions and national legislation?
- Examine the significance of the Maritime Labour Convention (MLC 2006) in protecting seafarers' rights. How does it complement other maritime conventions?

Problem-Solving / Case Study Questions

- A vessel carrying bulk grain cargo suffers damage during a storm. The cargo is partially lost, and emergency repairs are conducted at sea. Discuss the legal implications of *general average* and how costs would be distributed among stakeholders.
- A ship registered under a flag state fails to comply with MARPOL Annex V requirements and is found discharging garbage into the sea. What are the possible legal consequences under both international conventions and national law?
- During a voyage, a shipmaster refuses to take a compulsory pilot in a restricted area, leading to grounding. Analyze the legal responsibilities of the shipmaster and the shipowner.

- A bill of lading is issued for containerized goods, but upon arrival, the cargo is found damaged. Explain the liabilities of the carrier and the legal remedies available to the cargo owner.

Multiple Choice Questions (MCQ)

- Which international convention primarily regulates the prevention of pollution from ships?

  a) SOLAS

  b) MARPOL

  c) STCW

  d) UNCLOS

- Which document is considered proof of the contract of carriage and the receipt of goods?

  a) Charter Party

  b) Bill of Lading

  c) Tonnage Certificate

  d) Load Line Certificate

- The principle of *general average* requires that:

  a) Only the shipowner bears the loss

  b) The loss is shared proportionally among ship, cargo, and freight interests

  c) The insurer pays the full cost

  d) The master decides who pays without legal basis

Materials Used in the Course

Primary Textbooks and References

- **Özman, M.** *Introduction to Maritime Law*.
- **Aydoğdu, M.** *Maritime Law and Conventions: National and International Perspectives*.
- **Rodrigue, J-P.** *The Geography of Transport Systems* (selected chapters related to maritime law and shipping).
- **Gaskell, N., Asariotis, R., & Baatz, Y.** *Bills of Lading: Law and Contracts*.
- **Tetley, W.** *Marine Cargo Claims*.

International Conventions and Legal Documents

- **SOLAS (International Convention for the Safety of Life at Sea, 1974 and Protocols)**
- **MARPOL (International Convention for the Prevention of Pollution from Ships, 1973/78)**
- **STCW (Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended)**
- **UNCLOS (United Nations Convention on the Law of the Sea, 1982)**
- **COLREG (Convention on the International Regulations for Preventing Collisions at Sea, 1972)**
- **MLC (Maritime Labour Convention, 2006)**
- **Other IMO instruments and codes**: ISM, ISPS, IMDG, IAMSAR, Load Line Convention, etc.

Supplementary Materials

- IMO official publications and codes.
- National maritime legislation and case law documents.
- Ship documents (Bill of Lading, Charter Party, Tonnage Certificate, Load Line Certificate, Oil Record Book, etc.) as examples.
- Lecture notes and instructor-prepared handouts.
- Case studies from recent maritime accidents and legal disputes.

Digital and Online Resources

- IMO Document Repository (official website).
- International Maritime Organization (IMO) e-learning resources.
- Online databases of maritime law (e.g., HeinOnline, LexisNexis, Westlaw).
- Maritime court decisions and arbitration cases databases.

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	2	2	1	3	3	1	2
PO2	1	1	2	2	2	1	2	2	2	2
PO3	2	2	1	1	1	2	2	3	3	3
PO4	1	1	1	1	1	2	2	2	2	1
PO5	2	2	2	1	2	3	3	2	1	3
PO6	3	3	3	3	3	2	2	2	2	2
PO7	2	2	2	2	1	2	3	3	2	1
PO8	1	1	1	1	1	2	2	2	3	2
PO9	3	3	3	3	2	2	2	3	3	2
PO10	3	3	3	3	3	3	3	3	3	3
PO11	2	3	3	3	3	2	2	2	3	3
PO12	2	3	3	3	3	2	2	3	3	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1 – Scope, Sources & Principles of Maritime Law	Lecture, Multimedia Presentation, Case Studies	Quizzes, Assignments, Participation
CLO2 – Legal Status, Registration & Ship Documentation	Lecture, Tutorials, Group Discussions	Quizzes, Written Assignments, Midterm Exam
CLO3 – Authority & Responsibilities of Shipmasters/Owners	Case Studies, Role-Playing, Problem-Based Learning	Assignments, Observation, Practical Exercises
CLO4 – Charter Parties, Bills of Lading & Freight Contracts	Lecture, Workshops, Scenario-Based Exercises	Assignments, Case Study Reports, Midterm Exam
CLO5 – Maritime Accidents & Legal Procedures	Case Studies, Simulation Exercises, Group Work	Practical Case Reports, Assignments, Participation
CLO6 – National Maritime Legislation & Regulations	Lecture, Tutorials, Guided Practice	Quizzes, Written Assignments, Participation
CLO7 – International Maritime Conventions	Lecture, Workshops, Case Analysis	Assignments, Quizzes, Practical Exercises
CLO8 – Safety & Marine Pollution Responsibilities	Problem-Based Learning, Group Discussions	Assignments, Case Study Reports, Participation
CLO9 – Application of Maritime Law to Case Studies	Scenario-Based Learning, Workshops, Group Exercises	Case Study Reports, Practical Exercises, Assignments
CLO10 – Legal Reasoning & Professional Skills	Role-Playing, Debates, Group Presentations	Oral Presentations, Assignments, Participation

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**	**10**	**10**
Final Exam	**1**	**2**	**2**
Preparation for Final Exam	**1**	**20**	**20**
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	**1**	**10**	**20**
Individual Reading / Research	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**144**
ECTS Credit			**4**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	15	10
Laboratory	-	-
Application	-	-
Field Work	-	-
Special Course Internship (Work Placement)	-	-
Homework/Assignments	1	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	50
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 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: Marine Hydromechanics							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MEC310	IV	Fall	3	3	3	0	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	The course **Marine Hydromechanics** introduces the fundamental principles of fluid mechanics and their applications in marine engineering and naval architecture. It begins with an overview of frictional forces and their effects on fluid motion, followed by the study of moments of inertia, periodic motion, and rotating systems to provide students with a solid foundation in dynamics. The course emphasizes the relationships between work, energy, impulse, and momentum in marine systems, while also addressing the principles of hydraulics and hydrostatics as they apply to ship stability, propulsion, and fluid handling. Additionally, the course explores thermodynamic energy transfer in fluid systems, linking theoretical concepts to practical applications in marine vessels. Throughout the course, students engage in quizzes, problem-solving sessions, and mid-term and final examinations to reinforce comprehension of both the theoretical and applied aspects of marine hydromechanics. The course equips students with analytical and problem-solving skills necessary for understanding fluid behavior in marine engineering contexts.
Course Aims and Objectives	The aim of the course **Marine Hydromechanics** is to provide students with a comprehensive understanding of the fundamental principles of fluid mechanics and their practical applications in marine engineering and naval architecture. The course seeks to develop students' analytical and problem-solving skills in studying fluid behavior, dynamics, and energy transfer within marine systems. By the end of the course, students will be able to apply theoretical knowledge to real-world marine applications, including ship stability, propulsion, and fluid handling systems. • Understand the fundamental principles of fluid mechanics and hydromechanics as applied to marine engineering. • Analyze the effects of friction, moments of inertia, and rotational motion on marine systems. • Apply concepts of periodic motion, work, energy, impulse, and momentum in the context of marine hydrodynamics. • Examine and solve problems related to hydraulics, hydrostatics, and thermodynamic energy transfer in marine applications. • Develop the ability to perform calculations and simulations for ship stability, fluid flow, and energy transfer systems. • Integrate theoretical knowledge with practical marine engineering challenges through case studies, problem-solving exercises, and laboratory observations.
Course Learning Outcomes	**LO1 – Knowledge and Understanding** Demonstrate a solid understanding of fundamental fluid mechanics concepts, including friction, hydrostatics, hydraulics, thermodynamic energy transfer, rotational and periodic motion, and dynamic principles relevant to marine systems. **LO2 – Application of Knowledge** Apply principles of work, energy, impulse, momentum, and fluid dynamics to solve practical marine engineering problems, including calculations for fluid flow, pressure distribution, forces on marine structures, and propulsion systems. **LO3 – Analytical and Technical Skills** Perform hydrodynamic and mechanical calculations, analyze hydraulic and hydrostatic systems, compute moments of inertia, and interpret rotational dynamics and periodic motions in marine machinery and structures.

	LO4 – Evaluation and Critical Thinking Critically evaluate the performance and behavior of marine fluid systems, hydraulic and hydrostatic components, and propulsion-related energy transfers. Propose technically sound and efficient solutions to optimize system performance and safety. **LO5 – Communication and Interpretation** Communicate technical findings effectively through written reports, diagrams, and oral presentations. Present analyses, calculations, and engineering recommendations clearly to support decision-making and problem-solving. **LO6 – Problem-Solving and Decision-Making** Integrate theoretical knowledge with practical marine engineering scenarios, using problem-solving, simulation, and analytical techniques to address fluid-related challenges, optimize performance, and make informed engineering decisions.

Content of the Course

Week	*Subject*
1	Introduction, course overview
2	Friction
3	Quiz I / Moment of inertia
4	Moment of inertia
5	Moment of inertia
6	Periodic motion
7	Rotating motion
8	Mid-term examination
9	Dynamics
10	Work & Energy
11	Quiz II
12	Impulse and Momentum
13	Hydraulic and Hydrostatic
14	Thermodynamic transfer on the lines
15	Final Exams

Methods and Techniques Used in the Course

Lectures – Structured presentations covering core concepts, theories, and principles of fluid mechanics, rotational dynamics, hydraulics, and hydrostatics.

Interactive Discussions – Classroom discussions to clarify complex concepts, analyze real-world marine engineering scenarios, and encourage critical thinking.

Problem-Solving Sessions – In-class exercises and homework assignments where students solve numerical problems related to fluid flow, work-energy principles, and momentum-impulse analysis.

Quizzes – Periodic quizzes to assess understanding of key topics such as friction, moment of inertia, and periodic motion.

Case Studies – Application-based learning, including analysis of ship stability, fluid flow in marine machinery, and energy transfer in ship systems.

Laboratory Demonstrations and Simulations – Where possible, virtual or physical demonstrations of hydraulic systems, fluid flow visualization, and thermodynamic energy transfer in pipelines and vessels.

Mid-term and Final Examinations – Written assessments to evaluate comprehension, analytical skills, and ability to apply theoretical knowledge to practical problems.

Collaborative Learning – Group exercises, discussions, and presentations to enhance teamwork and technical communication skills.

Supplementary Software Tools – Use of engineering simulation tools for modeling fluid flow, hydrostatics, and thermodynamic processes in marine applications.

Sample Questions

Conceptual Questions

- Explain the difference between hydrostatic and hydrodynamic forces acting on a ship hull.
- Describe the role of friction in marine fluid systems and how it affects ship propulsion efficiency.
- Define moment of inertia and explain its significance in ship rolling and pitching motions.
- Discuss the importance of impulse and momentum principles in marine collision and docking operations.

Problem-Solving / Numerical Questions

- A cylindrical tank on a ship contains water of density 1000 kg/m³. Calculate the hydrostatic pressure at a depth of 3 meters.
- A ship's roll can be modeled as a simple harmonic oscillator. If the ship completes one oscillation in 8 seconds, calculate its angular frequency and period of motion.
- A rotor of a marine turbine has a moment of inertia of 2000 kg·m² and experiences a torque of 500 N·m. Determine the angular acceleration.
- A vessel is subject to a force of 10,000 N over a time interval of 5 seconds. Calculate the change in momentum imparted to the vessel.

Application / Case Study Questions

- Analyze the energy transfer in a hydraulic pump system on a ship. Identify losses due to friction and suggest efficiency improvement measures.
- Using the principles of periodic motion, evaluate the effect of added mass on ship stability in waves.
- A pipeline system onboard a vessel experiences pressure fluctuations. Discuss how thermodynamic energy transfer along the lines can affect flow performance.

Critical Thinking / Discussion Questions

- Compare and contrast the dynamic behavior of a vessel in calm water versus rough sea conditions.
- Explain how understanding friction and work-energy principles can prevent structural fatigue in ship machinery.
- Discuss how impulse-momentum analysis can be used in the design of safer ship maneuvering systems.
- Evaluate the importance of hydrostatic calculations in the design of ballast systems for cargo vessels.

Materials Used in the Course

Textbooks

- **"Hydromechanics for Marine Engineers"** – John F. Harper, 4th Edition, Elsevier, 2018
- **"Introduction to Marine Hydrodynamics"** – A. Faltinsen, Cambridge University Press, 2020
- **"Fluid Mechanics with Applications to Marine Engineering"** – Robert J. Spurk, Springer, 2019
- **"Applied Naval Architecture and Marine Hydrodynamics"** – Thomas Lamb, Butterworth-Heinemann, 2021

Supplementary Reading

- Academic journals: *Journal of Marine Science and Technology*, *Ocean Engineering*, *Journal of Ship Research*
- Technical manuals on ship dynamics, rolling, pitching, and hydrostatics
- IMO Guidelines on ship stability, hydrostatics, and ballast systems

Software and Tools

- **MATLAB / Simulink** – For simulations of ship rolling, pitching, and periodic motion
- **ANSYS Fluent / Computational Fluid Dynamics (CFD) Tools** – For flow analysis and friction loss calculations
- **Hydraulic Simulation Software** – For marine pipeline and pump analysis

Laboratory and Practical Equipment

- Ship model tanks for studying rolling, pitching, and hydrostatic forces
- Rotational platforms for moment of inertia and dynamics experiments
- Pressure sensors and flow meters for hydraulic and hydrostatic experiments
- Data acquisition systems for measuring periodic motion and impulse-momentum effects

Online Resources

- IMO educational resources and e-learning modules on ship stability and hydromechanics
- Video demonstrations of marine hydrodynamics experiments
- Online tutorials for MATLAB and CFD applications in marine engineering

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	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method (Instructional Strategy)**	**Assessment Method (Evaluation)**
CLO1 – Knowledge & Understanding	Lectures, Multimedia Presentations, Conceptual Discussions	Written Exams, Quizzes, Short Answer Questions
CLO2 – Application of Knowledge	Tutorials, Problem-Solving Sessions, Simulation Exercises	Homework Assignments, Practical Problem Sets, Lab Reports
CLO3 – Analytical & Technical Skills	Hydrodynamics Workshops, Calculations Labs, Simulation Exercises	Lab Reports, Analytical Assignments, Problem-Solving Exams
CLO4 – Evaluation & Critical Thinking	Scenario-Based Learning, Case Studies, Group Discussions	Case Study Reports, Evaluation Assignments, Oral Presentations
CLO5 – Communication and Interpretation	Technical Writing Workshops, Report Preparation, Team Exercises	Project Reports, Presentations, Documentation Assessment
CLO6 – Problem-Solving and Decision-Making	Problem-Based Learning, Applied Engineering Tasks, Simulation Projects	Practical Problem-Solving Reports, Decision-Making Exercises, Capstone/Project Evaluation

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
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	**3**	**3**	**9**
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			**96**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	3	15
Special Course Internship (Work Placement)	-	-
Homework/Assignments	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	1	15
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**8**	**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: Marine Electrotechnology II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED401	IV	Fall	3	3	2	2	0
Course type: Elective				**Prerequisite: x**		**Language:** English	
% Contribution to the Professional Fundamental Component				**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
				20	20	30	30
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	This course provides an in-depth study of advanced marine electrotechnical systems, focusing on shipboard electrical power generation, distribution, and propulsion. It covers both low- and high-voltage systems, AC/DC motors, and electrical protection mechanisms, including design and safety regulations. Students will gain practical experience with switchboards, generators, electrical propulsion units, asynchronous motors, and auxiliary systems through laboratory applications, projects, and case studies. The course emphasizes the integration of electrical systems for efficient ship operation, including alternative propulsion solutions, bow thrusters, and transformer power management. Students will develop skills in fault detection, system monitoring, measurement using advanced tools, and maintenance planning, while applying safety standards and surveying procedures. By the end of the course, students will be able to design, operate, and maintain complex marine electrical systems, analyze their performance, and implement safety and efficiency improvements within a shipboard environment. The course combines theory with hands-on practice to prepare students for professional roles in marine electrotechnology and ship engineering operations.
Course Aims and Objectives	**Course Aims** The course aims to provide students with comprehensive knowledge and practical skills related to advanced marine electrical systems. It focuses on the generation, distribution, protection, and control of electrical power onboard ships, including both conventional and alternative propulsion technologies. Students will gain the ability to integrate and operate complex electrical systems efficiently while ensuring safety, reliability, and compliance with international maritime standards. **Course Objectives** By the end of this course, students will be able to: • Understand the principles of shipboard electrical systems, including low- and high-voltage configurations, AC/DC motors, and generators. • Analyze and design electrical power distribution, switchboards, and protection mechanisms for marine applications. • Operate and maintain shipboard electrical propulsion systems, including alternative propulsion units and auxiliary motors. • Apply safety standards and regulations for electrical systems onboard ships, including fault detection, isolation, and preventive maintenance. • Use modern measurement, inspection, and monitoring tools to evaluate electrical system performance. • Integrate advanced electrotechnical systems to improve efficiency, reliability, and operational performance of marine vessels. • Plan, execute, and report on electrical maintenance, inspections, and operational procedures in a professional maritime context.
	CLO1 – Explain Shipboard Electrical Principles Explain the principles and components of shipboard electrical systems, including low/high-voltage networks, AC/DC motors, generators, and alternative propulsion units. **CLO2 – Analyze Electrical Circuits & Distribution** Analyze electrical circuits, power distribution systems, switchboards, synchronization processes, protection devices, and fault isolation methods.

Course Learning Outcomes	**CLO3 – Operate & Maintain Electrotechnical Systems** Operate, maintain, and troubleshoot shipboard electrical propulsion and auxiliary systems efficiently and in accordance with maritime rules and safety regulations. **CLO4 – Apply Measurement & Diagnostic Tools** Apply modern measurement, inspection, monitoring, and diagnostic tools to assess electrical system performance and identify faults. **CLO5 – Design & Improve Electrical Protection Systems** Design and propose improvements for electrical protection systems, emergency switchboards, automation interfaces, and integrated electrotechnical applications. **CLO6 – Documentation, Safety & Regulatory Compliance** Implement safety procedures, preventive maintenance protocols, and prepare formal reports/documentation for inspections and operational checks in compliance with IMO and SOLAS standards.

Content of the Course

Week	*Subject*
1	General aspects of Marine Electrotechnical equipment, characteristics, low and high voltage
2	Electrical work, energy, power formulations and electrical efficiency
3	Electrical circuit line systems, phase diagrams, improvement of electrical system management
4	Electrical power production with generators, alternative propulsion (AVM-APS) applications and electrical propulsion
5	Shaft generators and utility of bow thruster asynchronous motors, power integration of transformers
6	Series and parallel connection of generators, protection mechanism, auxiliary switchboard synchronization
7	AC/DC Motors protectional devices and protectional system design
8	Mid-term Application (Efficient operation and protection)
9	Fundamental safety regulations, electrics/electrotechnological marine electrical components' safety requirements, mechanism and maintenance.
10	Use of Electrical inspection tools and high-tech measurement devices, determination tools and e-reporting
11	Survey preparations of switchboards and switchboard tests, damage and isolation tests of safety limitation systems
12	Extra-ordinary electrical installations and isolations in area of ex-proof, very low transmission and control systems, design and management principal
13	Shipboard Electrotechnology's I: Asynchronous motors starters, integration with safety systems, drive mechanisms and remote control
14	Shipboard Electrotechnology's II: Electrical propulsion, motor speed control units and governing actuation, alternative energy solutions applications
15	Final Exam Application (Alternative operational design)

Methods and Techniques Used in the Course

Lectures:

- Theoretical instruction covering fundamental and advanced marine electrical principles, system integration, and safety regulations.

Laboratory Sessions / Practical Applications:

- Hands-on exercises with shipboard electrical components, including motors, generators, switchboards, and control systems.
- Simulated fault-finding, operational testing, and efficiency evaluations using real and virtual training devices.

Case Studies:

- Analysis of real-world shipboard electrical system failures, troubleshooting, and repair strategies.
- Application of knowledge to alternative propulsion and energy management scenarios.

Projects:

- Design and planning exercises for electrical systems, including safety integration, synchronization, and automation.

Assignments:

- Problem-solving exercises related to calculations of electrical work, efficiency, load distribution, and protection system design.

Group Work:

- Collaborative exercises to integrate theoretical knowledge into practical scenarios, including switchboard management, propulsion system integration, and emergency response simulations.

Simulation and E-Tools:

- Use of electrical measurement devices, inspection tools, and computer-based simulations for operational planning, fault detection, and performance analysis.

Sample Questions

Multiple Choice / Short Answer

- Explain the difference between low-voltage and high-voltage marine electrical systems.
- What are the key safety considerations when working with AC and DC shipboard systems?
- Identify the function of a shaft generator in electrical propulsion systems.
- Which devices are used to protect AC motors from overcurrent, overload, and short-circuit conditions?
- Explain the advantages of parallel vs. series connection of shipboard generators.

Problem-Solving / Calculation

- Calculate the efficiency of a marine generator given input and output power data.
- Determine the load sharing between two generators connected in parallel.
- Compute the power requirement for a bow thruster driven by an asynchronous motor in a specific operation scenario.
- Analyze an electrical circuit diagram to identify potential faults or inefficiencies.

Case Study / Scenario-Based Questions

- A ship experiences a partial failure of its AC motor starter system. Describe the steps for troubleshooting and maintaining operational safety.
- Discuss how to integrate an alternative propulsion system (AVM-APS) with existing switchboard and safety systems.
- A newly installed electrical propulsion system shows abnormal vibrations and temperature rise. Prepare a maintenance and monitoring plan.
- Evaluate a shipboard electrical system for compliance with safety regulations and propose improvements.

Essay / Conceptual Questions

- Explain the role of electrical propulsion in improving fuel efficiency and environmental compliance onboard modern ships.
- Discuss the importance of electrical inspection tools and measurement devices in maintaining marine electrotechnical systems.

Materials Used in the Course

Textbooks and Reference Books:

- Standard marine electrotechnical textbooks covering AC/DC systems, electrical propulsion, generators, and control systems.
- Reference manuals on shipboard safety regulations, electrical inspections, and alternative energy solutions.

Technical Standards and Guidelines:

- IMO regulations (SOLAS, MARPOL, etc.) relevant to marine electrical systems.
- IEC and IEEE standards for electrical safety, motor protection, and system integration.
- Ship-specific manuals for generators, propulsion systems, and auxiliary machinery.

Simulation Tools and Software:

- Marine electrical simulation software for system operation, fault detection, and efficiency analysis.
- Modeling tools for alternative propulsion and electrical integration scenarios.

Laboratory Equipment:

- AC/DC motors, generators, and transformers.
- Switchboards, control panels, and protection devices.
- Measurement instruments: multimeters, meggers, oscilloscopes, current and voltage sensors.
- High-tech diagnostic tools for e-reporting and system analysis.

Workshop Materials:

- Wiring kits, fuses, circuit breakers, and connectors for hands-on assembly and testing.
- Safety equipment for electrical maintenance tasks (gloves, mats, insulation tools).

Case Study Resources:

- Operational data, real shipboard fault reports, and maintenance logs for analysis.
- Project guidelines for electrical system optimization, alternative energy solutions, and operational safety.

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, Visual Presentation, Problem-Solving Sessions	Midterm Exam, Quizzes
CLO2	Lecture, Guided Problem Solving, In-class Exercises	Midterm Exam, Final Exam
CLO3	Lecture, Practical Demonstrations, Analytical Exercises	Assignments, Midterm Exam
CLO4	Lecture, Case Studies, Group Discussion	Final Exam, Assignments
CLO5	Workshop Applications, Fault Analysis Sessions, Case Studies	Lab/Workshop Evaluation, Assignments
CLO6	Practical Sessions, Project-Based Learning, Technical Review Activities	Project Report, Final Exam

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	-	-	-
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	**1**	**8**	**8**
Group Work	-	-	-
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory / Practical Applications	**4**	**4**	**16**
Assignment(s)/Homework/Class Works	**2**	**4**	**8**
Micro-Teaching Sessions	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**108**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	4	20
Field Work	-	-
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	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: Maritime English II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED403	IV	Fall	3	2	3	0	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 09.30-12.20			
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	The course *Marine Technical Reporting and Formal Documentation* focuses on the principles and practices of professional written communication within the maritime industry, with particular emphasis on engineering operations, regulatory compliance, and technical documentation. Students are introduced to the fundamentals of formal writing, reporting, and correspondence in contexts such as performance monitoring, engine failures, maintenance systems, bunkering, dry-docking, and spare parts management. The course also examines the documentation and reporting requirements imposed by international maritime conventions (SOLAS, MARPOL), classification societies, and flag/port state authorities. Students will learn to prepare, analyze, and evaluate technical documents such as performance reports, inspection surveys, risk assessments, and certification records in accordance with industry standards. Through case studies, practical exercises, and report-writing applications, the course aims to develop students' ability to produce accurate, concise, and professional reports that ensure safety, compliance, and operational efficiency in maritime engineering. The integration of risk management, legal and commercial certification, and performance evaluation further enhances the students' competence in technical communication, making them capable of addressing real-world challenges in marine engineering operations.
Course Aims and Objectives	The primary aim of this course is to equip students with the knowledge and skills necessary for preparing, analyzing, and managing technical and formal documentation in the maritime industry. It seeks to develop students' professional competence in technical writing, reporting, and compliance documentation required for safe, efficient, and legally sound ship operations. The course also aims to foster critical thinking and problem-solving abilities in the preparation of reports related to marine engineering failures, maintenance practices, inspections, and risk assessments. By doing so, it ensures that students can effectively contribute to both operational performance and regulatory compliance within the framework of international maritime standards. • Understand the principles of formal writing and apply them to professional maritime documentation. • Prepare performance reports, failure analysis reports, and repair documentation for engineering operations. • Develop technical records related to bunkering, spare parts requisition, supply chain management, and dry-dock preparations. • Gain familiarity with the role of classification societies, flag states, and port state control in documentation and inspection procedures. • Apply the principles of planned maintenance systems and prepare related documentation. • Produce inspection and survey reports in accordance with the SOLAS and MARPOL conventions for different ship types. • Understand the legal and commercial requirements of ship certification and prepare relevant records. • Conduct and document risk assessment and risk management processes using industry-standard methodologies such as risk matrixes. • Evaluate technical performance and prepare comprehensive reports that support decision-making in ship management. • Demonstrate professional communication skills in both technical and regulatory contexts, ensuring clarity, accuracy, and compliance with international standards.

Course Learning Outcomes	**LO1 – Knowledge and Understanding** Understand the principles of formal maritime writing, technical reporting, and documentation requirements, including industry standards, classification society regulations, flag state and port state inspection protocols, and international conventions such as SOLAS and MARPOL. **LO2 – Application of Knowledge** Apply reporting techniques to prepare professional documents for engine performance, operational failures, repair activities, bunkering operations, spare part requisitions, supply orders, dry-dock preparations, and planned maintenance systems (PMS). **LO3 – Analytical and Technical Skills** Analyze marine engine failures and operational incidents, identify root causes, evaluate performance, and document findings in structured technical reports. Conduct structured risk assessments using standard methodologies and develop risk matrices. **LO4 – Evaluation and Critical Thinking** Evaluate technical and regulatory compliance of ship operations, interpret classification society and regulatory requirements, and recommend corrective or improvement actions based on documented analyses. **LO5 – Communication and Interpretation** Demonstrate professional communication skills in written technical English for maritime operations. Prepare clear, accurate, and structured reports, certifications, and official correspondence in compliance with maritime conventions and industry standards. **LO6 – Problem-Solving and Decision-Making** Apply critical thinking and decision-making skills to propose solutions for operational failures, maintenance planning, and regulatory compliance, ensuring safe, efficient, and legally compliant ship operations.

Content of the Course

Week	*Subject*
1	Principle of formal writing and job application
2	Preparation of performance report in engine room and writing and record
3	Engine failures, recognizing failures and repair inform and report
4	Bunkering, Supply, Spare parts, request parts and orders
5	Class companies and flag state control formal writings
6	Preparation for docking, dry-dock recording and formal writing
7	Mid-Term Examination
8	Failure analyses, recognizing, maintenance repair
9	Principle of planned maintenance system
10	Classification societies and port state control inspection surveys for the SOLAS Convention in accordance with the principles of various ship types
11	Classification societies and port state control inspection surveys for the MARPOL Convention in accordance with the principles of various ship types
12	Legal and commercial certification of ships
13	Risk assessment and risk management / Risk Matrixes
14	Technical performance evaluation and reporting
15	Final Exams

Methods and Techniques Used in the Course

Lectures and Interactive Presentations

- Conceptual explanations of formal maritime writing, report structures, and regulatory frameworks.
- Use of real-world case studies to demonstrate reporting requirements for engine room operations, inspections, and maintenance activities.

Practical Exercises and Workshops

- Hands-on preparation of performance reports, failure analysis reports, and technical documentation.
- Simulated exercises for drafting supply requests, bunkering records, and docking preparations.

Case Study Analysis

- Examination of real or simulated marine engine failures, maintenance issues, and inspection scenarios.
- Structured evaluation of failures and preparation of formal written reports outlining findings and corrective measures.

Group Discussions and Peer Review

- Collaborative critique of reports and documentation to improve clarity, accuracy, and adherence to professional standards.
- Discussion of risk assessment scenarios and reporting strategies.

Guided Use of Reference Materials

- Engagement with international conventions (SOLAS, MARPOL), flag state guidelines, and classification society documentation.
- Application of these references to prepare legally and commercially compliant documents.

Simulations and Role-Playing

- Role-playing exercises for reporting during inspections, audits, and emergency situations.
- Simulated dry-dock and maintenance reporting scenarios to reinforce practical skills.

Computer-Assisted Documentation

- Use of word processing and spreadsheet software to prepare structured reports and performance evaluations.
- Introduction to digital tools for record keeping, risk matrices, and documentation management.

Mid-Term and Final Application Exercises

- Scenario-based exercises requiring students to produce complete reports incorporating all course learning outcomes.
- Evaluation of students' ability to communicate technically in written English for maritime operations.

Sample Questions

Short Answer Questions

- Define the purpose of a performance report in the engine room and list its main components.
- Explain the difference between a corrective maintenance report and a preventive maintenance report.
- What are the key considerations when drafting a bunkering or supply request?
- Describe the role of classification societies and port state control in ship inspections.
- List three essential elements that must be included in a docking or dry-dock report.

Scenario-Based Questions

- Your engine experiences a sudden failure during a voyage. Prepare an outline of the formal report you would submit, including all key technical and operational details.
- A port state control officer has identified deficiencies in the ship's MARPOL compliance. Draft a brief response report addressing the findings and proposed corrective actions.
- During a planned maintenance survey, several engine parts require replacement. Write a formal request for spare parts, including justification and technical specifications.

Essay/Discussion Questions

- Discuss the importance of clear and precise technical documentation for safety and operational efficiency on board.
- Analyze how risk assessment reports can prevent accidents and improve ship performance.
- Evaluate the role of international conventions (SOLAS, MARPOL) in shaping shipboard reporting practices.

Practical Application Questions

- Create a sample performance report for an engine room operation over a 24-hour period, including recorded parameters, anomalies, and recommendations.
- Draft a maintenance failure analysis report for a scenario where a turbocharger malfunctioned during operation.
- Prepare a risk matrix for a ship undergoing bunkering, highlighting potential hazards, likelihood, and mitigation measures.

Materials Used in the Course

Textbooks & Reference Books

- **Shipboard Operations and Technical Documentation** – Covers formal reporting standards, maintenance logs, and technical record keeping.
- **Marine Engineering Knowledge: Reports and Record-Keeping** – Practical guide for engine room documentation, fault reporting, and performance evaluation.
- **SOLAS and MARPOL Conventions: Technical Guidelines** – Provides legal requirements for ship surveys, inspections, and formal reporting.
- **Risk Management and Safety on Board Ships** – Covers risk assessment principles, risk matrices, and incident reporting.
- **Planned Maintenance Systems in Maritime Engineering** – Reference for maintenance planning, preventive procedures, and reporting standards.

Digital & Online Resources

- **Ship Management Software Manuals** – For electronic logging, maintenance tracking, and performance monitoring.
- **Port State Control Inspection Guidelines (PSC)** – Official PDF documents for various flag states.
- **Classification Society Survey Procedures** – Online access to DNV, Lloyd's Register, ABS survey forms, and templates.

Practical & Supplementary Materials

- Sample engine room logbooks and performance report templates.
- Fault reporting forms and maintenance request forms.
- Case studies for engine failures, docking operations, and risk assessment exercises.
- Checklists for MARPOL and SOLAS compliance.
- Technical dictionaries and maritime English reference guides for formal writing.

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	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1 – Knowledge and Understanding	Lecture, Reading Assignments, Industry Guidelines Review	Written Quizzes, Short Answer Tests, Literature Review Assignments
CLO2 – Application of Knowledge	Hands-on Exercises, Case Studies, Lab Simulations	Practical Assignments, Report Writing, Document Preparation Tasks
CLO3 – Analytical and Technical Skills	Problem-Based Learning, Engine Simulation Labs, Case Analysis	Technical Reports, Root Cause Analysis Exercises, Risk Assessment Assignments
CLO4 – Evaluation and Critical Thinking	Group Discussions, Case Studies, Regulatory Compliance Workshops	Critical Evaluation Reports, Scenario Analysis, Regulatory Compliance Assessments
CLO5 – Communication and Interpretation	Writing Workshops, Technical English Practice, Peer Review	Structured Report Submission, Professional Correspondence Assessment, Presentation Evaluation
CLO6 – Problem-Solving and Decision-Making	Scenario-Based Learning, Decision-Making Exercises, Simulated Operational Failures	Problem-Solving Assignments, Maintenance Planning Exercises, Case Study Solutions

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
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	**3**	**3**	**9**
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			**96**
ECTS Credit			**2**

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	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method (Instructional Strategy)**	**Assessment Method (Evaluation)**
CLO1 – Knowledge & Understanding	Lectures, Multimedia Presentations, Conceptual Discussions	Written Exams, Quizzes, Short Answer Questions
CLO2 – Application of Knowledge	Tutorials, Technical Report Workshops, Practical Exercises	Assignments, Lab Reports, Technical Documentation Tasks
CLO3 – Analytical & Technical Skills	Case Studies, Failure Analysis Workshops, Risk Assessment Exercises	Problem-Solving Reports, Analytical Assignments, Risk Matrix Documentation
CLO4 – Evaluation & Critical Thinking	Scenario-Based Learning, Regulatory Compliance Exercises, Group Discussions	Case Study Reports, Evaluation Assignments, Oral Presentations
CLO5 – Communication and Teamwork	Technical Writing Workshops, Team Assignments, Peer Review Exercises	Project Reports, Group Presentations, Peer Assessment
CLO6 – Problem-Solving and Decision-Making	Problem-Based Learning, Applied Operational Tasks, Simulation Exercises	Practical Problem-Solving Reports, Decision-Making Exercises, Capstone/Project Evaluation

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	3	15
Special Course Internship (Work Placement)	-	-
Homework/Assignments	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	1	15
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**8**	**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: Theory of Marine Steam Engines and Boilers							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
MED405	IV	Fall	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				**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 an advanced study of marine steam engines, boilers, and modern energy conversion systems in maritime engineering. It begins with a comprehensive review of conventional power cycles, including Rankine, Otto, Diesel, Sabathe, and Brayton cycles, highlighting their operational principles, efficiencies, and limitations. Modifications to internal combustion cycles are explored to improve efficiency and reduce harmful emissions, including Atkinson and Miller cycles, common rail injection systems, homogeneous charge compression ignition (HCCI), reactivity-controlled compression ignition (RCCI), reactivity-controlled spark ignition (RCSI), and hydrogen combustion engines. The course addresses environmental compliance in maritime operations, covering the International Maritime Organization (IMO) regulations for reducing carbon, NOx, and SOx emissions, as well as exhaust gas treatment systems, including selective catalytic reduction (SCR) and sulfur oxide filtration. Students are introduced to emerging alternative energy sources, including fuel cells, photovoltaic conversion systems, nuclear batteries, wind and water turbines, and osmotic power systems such as pressure-retarded osmosis (PRO) and reverse-osmosis desalination. Advanced thermodynamic cycles, including Kalina and Organic Rankine cycles, are examined in the context of energy efficiency and marine propulsion. The course also covers alternative fuels, including LNG, methanol, ammonia, liquefied hydrogen, biodiesel, and biogas, as well as methods for energy storage in thermal, magnetic, and mechanical forms. Practical applications and case studies are integrated into the course, including discussions of alternative propulsion and energy systems, as well as regulatory frameworks such as IMO MEPC 82, Initial GHG Strategies (ISWG-GHG-17), Carbon Intensity Indicator (CII) revisions, Global Fuel Standards (GFS), and greenhouse gas (GHG) strategies. Through these analyses, students gain the knowledge required to assess, implement, and manage sustainable and compliant energy solutions in maritime operations. The course combines theoretical foundations with applied exercises, case studies, and regulatory discussions, preparing students for future challenges in marine engineering and sustainable ship propulsion.
Course Aims and Objectives	The aim of this course is to provide students with a comprehensive understanding of marine steam engines, boilers, and modern energy systems used in maritime engineering. The course emphasizes thermodynamic principles, cycle analysis, environmental regulations, and alternative propulsion technologies. Students will develop the ability to analyze engine performance, evaluate energy efficiency, apply emission reduction strategies, and understand the integration of alternative energy sources in marine applications. • Review and analyze conventional and modified power cycles (Rankine, Otto, Diesel, Sabathe, Brayton, Atkinson, Miller, HCCI, RCCI, RCSI, and hydrogen combustion engines). • Understand and apply IMO regulations for carbon, NOx, and SOx emission reduction in maritime operations. • Evaluate exhaust gas treatment systems, including selective catalytic reduction (SCR) and sulfur oxide filtration.

	• Examine alternative energy systems and fuels, such as fuel cells, photovoltaic conversion, wind and water turbines, osmotic power, LNG, methanol, ammonia, hydrogen, biodiesel, and biogas. • Analyze advanced thermodynamic cycles, including Kalina and Organic Rankine cycles, for marine energy efficiency. • Conduct case studies on alternative propulsion systems, energy strategies, and IMO regulations related to greenhouse gas emissions and carbon intensity. • Assess the operational, environmental, and economic impacts of various marine energy technologies. • Integrate theoretical knowledge with practical applications in marine propulsion, energy management, and regulatory compliance.
Course Learning Outcomes	**LO1 – Knowledge and Understanding** Demonstrate knowledge of conventional and modified thermodynamic cycles (Rankine, Otto, Diesel, Sabathe, Brayton, Atkinson, Miller, HCCI, RCCI, RCSI), alternative fuels, and advanced propulsion systems. Understand IMO regulations, emission control technologies, and environmental impact metrics such as CII and GFS. **LO2 – Application of Knowledge** Apply thermodynamic principles and regulatory requirements to analyze power cycles, emission control systems, alternative propulsion methods, and energy management techniques in marine engineering systems. **LO3 – Analytical and Technical Skills** Evaluate performance characteristics of conventional and modified power cycles, emission control systems, and alternative energy sources. Conduct environmental impact assessments, including carbon, NOx, and SOx emissions, and analyze case studies related to marine propulsion systems. **LO4 – Evaluation and Critical Thinking** Critically assess the efficiency, sustainability, and environmental compliance of marine propulsion and energy systems. Integrate technical, operational, and regulatory knowledge to propose improvements and optimize system performance. **LO5 – Communication and Interpretation** Interpret and communicate findings from thermodynamic analyses, emission assessments, and case studies using appropriate technical language, diagrams, and reports to support decision-making and regulatory compliance. **LO6 – Problem-Solving and Decision-Making** Develop critical thinking and decision-making skills to propose effective solutions for sustainable, efficient, and environmentally compliant marine propulsion and energy systems based on operational, technical, and environmental data.

Content of the Course

Week	*Subject*
1	Review of conventional power cycles Rankine, Otto, Diesel, Sabathe and Brayton cycles
2	Modifications of internal combustion cycles for higher efficiencies and less harmful emissions a. Atkinson / Miller cycles b. Common rail injection schemes c. Homogeneous charge - compression ignition (HCCI) engines d. Reactivity-controlled compression ignition (RCCI) engines e. Reactivity-controlled spark ignition (RCSI) engines f. Hydrogen combustion engines
3	International Maritime Organization's rules for reduced Carbon emissions and NOX-SOX emissions and exhaust gas filtering systems – Selective catalytic reduction (SCR) and sulfur oxides filtration of exhaust gases
4	Fuel cells, theory and types
5	Theory of semiconductors and photovoltaic electric conversion, nuclear batteries
6	Wind turbines and water turbines
7	Osmotic power systems: Pressure-retarded osmosis (PRO) power generation and reverse-osmosis freshwater generation
8	Mid-Term Exam / Application (where applicable)
9	Kalina and Organic Rankine cycles
10	Alternative fuels – LNG, Methanol, Ammonia, Liquefied Hydrogen, Biodiesel and Biogas.
11	Storage of energy in heat, magnetic and mechanical forms
12	Case Study 1: Alternative propulsion discussions in marine engineering
13	Case Study 2: Alternative energy discussions in marine engineering
14	Case Study 3: Discussions of IMO MEPC 82, Initial GHG Strategies (ISWG-GHG-17), Carbon Intensity Indicator (CII) revision, Global Fuel Standard (GFS) and greenhouse gas (GHG) Strategies and future of energy efficiency regulations
15	Final exam / Application (Where applicable)

Methods and Techniques Used in the Course

Lectures and Interactive Presentations:

- Systematic explanation of conventional and modified power cycles, alternative fuels, and emission control systems.
- Use of diagrams, charts, and animations to visualize thermodynamic processes, engine components, and energy systems.

Case Studies and Real-World Applications:

- Analysis of IMO MEPC strategies, CII, GFS, and alternative propulsion systems in marine engineering.
- Group discussions and problem-solving exercises based on real ship operations and energy efficiency challenges.

Problem-Based Learning (PBL):

- Thermodynamic calculations of engine cycles, fuel consumption, and emission levels.
- Scenario-based problem solving to optimize engine efficiency and assess environmental impacts.

Simulations and Software Tools:

- Use of marine engineering simulation software to model Rankine, Brayton, and alternative cycles.
- Performance analysis of boilers, fuel cells, and renewable energy systems.

Laboratory Demonstrations and Experiments (where applicable):

- Practical demonstrations of combustion processes, thermodynamic measurements, and emission monitoring.
- Hands-on experience with energy storage systems and fuel cell setups.

Independent and Group Projects:

- Research assignments on alternative fuels, environmental compliance, and energy efficiency strategies.
- Group projects to analyze case studies and prepare technical reports on marine propulsion systems.

Mid-Term and Final Assessments:

- Written exams, calculations, and application-based problem-solving tests.
- Evaluation of case studies and students' ability to apply theoretical knowledge to practical scenarios.

Discussion and Feedback Sessions:

- Interactive question-and-answer sessions to reinforce theoretical concepts.
- Peer-to-peer discussions to enhance critical thinking and collaborative learning.

Sample Questions

Thermodynamics & Engine Cycles

- Compare and contrast the Rankine, Brayton, Otto, Diesel, and Sabathe cycles in terms of efficiency, work output, and practical marine applications.
- Calculate the thermal efficiency of an ideal Rankine cycle given boiler pressure, condenser pressure, and turbine inlet temperature.
- Discuss how modifications like the Atkinson or Miller cycles improve efficiency in internal combustion engines.

Alternative Fuels & Combustion

- Explain the advantages and challenges of using LNG, Methanol, Ammonia, or Hydrogen as marine fuels.
- Analyze the environmental impacts of NOx and SOx emissions from marine engines and the techniques used to reduce them, including SCR and exhaust gas filtration systems.
- Describe the principles of Homogeneous Charge Compression Ignition (HCCI) and Reactivity-Controlled Compression Ignition (RCCI) engines.

Marine Energy Systems & Regulations

- Evaluate the impact of IMO MEPC 82 strategies, Global Fuel Standards (GFS), and Carbon Intensity Indicator (CII) revisions on ship propulsion and energy efficiency.
- Discuss the role of Kalina and Organic Rankine cycles in marine energy recovery systems.
- Case Study Question: Propose an alternative propulsion system for a mid-sized cargo vessel to reduce greenhouse gas emissions while maintaining operational efficiency.

Energy Conversion & Storage

- Explain the working principles of fuel cells and photovoltaic energy conversion in marine applications.
- Compare osmotic power generation and reverse-osmosis freshwater generation as alternative energy sources on ships.
- Discuss the methods of storing energy mechanically, thermally, and magnetically on marine vessels.

Application & Problem-Solving

- Perform a performance analysis of a given marine steam engine based on operational data provided.
- Identify potential failures in a marine boiler system and propose corrective actions.
- Analyze the effects of supercharging, turbocharging, or sequential turbocharging on the performance of marine engines.

Materials Used in the Course

Textbooks & Reference Books

- *Marine Steam Engineering* – A. D. Bates
- *Marine Boilers* – J. H. Davies
- *Internal Combustion Engines: Applied Thermosciences* – T. H. Cengel & J. M. Cimbala
- *Marine Engineering* – D. S. Taylor
- IMO publications on *Emission Control and Energy Efficiency*

Lecture Notes & Handouts

- Instructor-prepared slides and notes covering thermodynamic cycles, marine steam engines, and boiler systems.
- Case study handouts on alternative fuels and IMO regulations.
- Problem sets for calculations related to thermal efficiency, emissions, and engine performance.

Software & Simulation Tools

- MATLAB / Simulink for cycle analysis and engine performance simulations.
- Thermodynamic cycle simulation software (e.g., EES – Engineering Equation Solver).
- Virtual lab tools for boiler and engine operation simulations.

Standards & Regulations

- IMO MEPC guidelines and regulations (CII, GFS, MARPOL Annex VI).
- Classification society rules (DNV, Lloyd's Register, ABS) relevant to marine boilers and engines.
- ISO and ASTM standards for fuels and emissions.

Multimedia & Online Resources

- Instructional videos on marine engine and boiler operations.
- Webinars and online case studies from marine engineering associations.
- Interactive e-learning modules for emission control technologies and alternative fuel engines.

Laboratory & Practical Materials

- Engine and boiler models for demonstration in laboratory sessions.
- Tools and instruments for measuring pressure, temperature, and emissions in practical exercises.
- Manuals and checklists for marine engine operation and maintenance 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	3	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method (Instructional Strategy)**	**Assessment Method (Evaluation)**
CLO1 – Knowledge & Understanding	Lectures, Multimedia Presentations, Conceptual Discussions	Written Exams, Quizzes, Short Answer Questions
CLO2 – Application of Knowledge	Tutorials, Problem-Solving Sessions, Simulation Exercises	Homework Assignments, Practical Problem Sets, Lab Reports
CLO3 – Analytical & Technical Skills	Case Studies, Performance Analysis Workshops, Energy Cycle Simulations	Analytical Assignments, Case Study Reports, Problem-Solving Exams
CLO4 – Evaluation & Critical Thinking	Scenario-Based Learning, Comparative Cycle Evaluations, Group Discussions	Evaluation Reports, Case Study Presentations, Oral Assessments
CLO5 – Communication and Interpretation	Technical Writing Workshops, Report Preparation, Team Exercises	Project Reports, Presentations, Documentation Assessment
CLO6 – Problem-Solving and Decision-Making	Problem-Based Learning, Applied Engineering Tasks, Sustainability Projects	Practical Problem-Solving Reports, Decision-Making Exercises, Capstone/Project Evaluation

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
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	**3**	**3**	**9**
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			**96**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	3	15
Special Course Internship (Work Placement)	-	-
Homework/Assignments	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	1	15
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**8**	**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: Ship Construction II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
NRC401	IV	Fall	2	2	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	40	40	-
Course Venue and Time				Friday / 09:30 – 11:20			
Instructor information				**Prof. Dr. Deniz Ünsalan** Faculty of Maritime Studies Wednesday / 09:00 - 12:00 +90 (392) 650 26 00 / 4060 deniz.unsalan@kyrenia.edu.tr www.kyrenia.edu.tr			

Course Description	This course provides an in-depth study of ship structural design, stability, and damage management. It focuses on advanced ship construction materials, welding techniques, bulkheads, doors, and corrosion prevention. Students will learn about surveys, inspections, and maintenance procedures for hull and machinery, as well as principles of transverse, dynamic, and damaged ship stability. The course also covers international regulations, IMO guidelines, and the practical application of maritime English for shipboard operations, cargo handling, and crew management. By the end of the course, students will be able to analyze, evaluate, and apply ship construction and stability concepts in both theoretical and practical maritime contexts.
Course Aims and Objectives	The course aims to provide students with a comprehensive understanding of advanced ship construction principles, ship stability, and damage management. It seeks to equip students with the knowledge and skills required to evaluate ship structures, apply international regulations, and ensure safe and efficient ship operations. • To understand ship construction materials, welding techniques, and structural components. • To analyze the principles of transverse, dynamic, and damaged ship stability. • To conduct and interpret surveys for hulls, machinery, and propeller shafts. • To apply IMO guidelines and international regulations related to ship stability and damage control. • To develop practical skills in shipboard operations, including cargo handling and crew organization. • To use maritime English effectively for ship construction, stability, and operational communication. • To evaluate and mitigate the effects of corrosion, damage, and water ingress on ship safety and performance.
	CLO1: Identify and describe shipbuilding materials, structural components, and their functions. **CLO2:** Explain different types of welding, common welding defects, and methods for inspection and quality control. **CLO3:** Analyze ship stability, including transverse, dynamic, and initial stability, and interpret stability curves.

Course Learning Outcomes	**CLO4:** Evaluate the impact of damage, flooding, and water ingress on ship trim and stability, applying IMO guidelines. **CLO5:** Conduct and interpret hull, machinery, and propeller shaft surveys according to international standards. **CLO6:** Apply principles of corrosion prevention, including galvanic corrosion control, in ship maintenance. **CLO7:** Utilize maritime English terminology related to ship structure, stability, and onboard operations. **CLO8:** Plan and organize shipboard operations, including crew roles, cargo handling, and emergency procedures. **CLO9:** Integrate knowledge of international conventions and codes to ensure compliance in ship construction and safety management. **CLO10:** Demonstrate the ability to synthesize ship construction, maintenance, and operational knowledge to solve practical maritime engineering problems.

Content of the Course

Week	*Subject*
1	**Introduction to Ship Structure** • Overview of ship construction materials • Types of ships and structural components
2	**Introduction to Ship Structure** • Overview of ship construction materials • Types of ships and structural components
3	**Bulkheads and Structural Partitions** • Types of bulkheads and their functions • Fire and watertight bulkheads
4	**Doors and Hatches** • Watertight and weather-resistant doors and hatches • Design and operational considerations
5	**Corrosion in Ships** • Corrosion and galvanic corrosion • Methods for prevention and protection
6	**Surveys and Inspections – Part 1** • Propeller shaft surveys • Dry-docking inspections
7	**Surveys and Inspections – Part 2** • Hull and machinery renewal surveys • Inspection reports and procedures
8	**Ship Stability – Basics** • Initial transverse stability • Static stability curves • Factors affecting stability
9	**Ship Stability – Advanced Concepts** • Stability deterioration • Dry-docking stability considerations • Dynamic stability
10	**Damage and Flooding Effects on Trim and Stability – Part 1** • Damaged ship stability principles • IMO regulations regarding damaged ship stability
11	**Damage and Flooding Effects on Trim and Stability – Part 2** • Effects of flooding and damage on trim and stability • Preventive measures and corrective actions
12	**Stability Theories and IMO Guidelines** • Theoretical aspects of ship trim and stability

	• IMO recommendations and international codes
13	**Maritime English – Ship Structure and Components** • Cargo handling equipment • Windlasses, rope winches, anchors, and mooring lines • Navigation commands and shipboard terminology
14	**Maritime English – Crew and Shipboard Organization** • Crew roles and responsibilities • Work organization aboard ship
15	**Maritime English – Crew and Shipboard Organization** • Crew roles and responsibilities • Work organization aboard ship

Methods and Techniques used in the Course

Lectures and Presentations – Detailed explanations of ship structures, welding techniques, stability principles, and international regulations.

Case Studies – Analysis of real-world incidents related to ship damage, flooding, and stability issues.

Practical Workshops – Hands-on exercises in welding inspection, structural assessment, and stability calculations.

Simulations – Use of software and modeling tools to study ship trim, stability, and damage scenarios.

Shipyard Visits / Field Trips – Observations of shipbuilding processes, materials, and structural elements in practice.

Group Discussions and Seminars – Collaborative problem-solving on ship construction and safety challenges.

Maritime English Exercises – Practice of technical terminology and documentation relevant to ship construction and stability.

Assessment Exercises – Calculations, surveys, and scenario-based assignments to reinforce learning.

Sample Questions

- Explain the different types of welding defects and describe the methods used to detect them.
- Discuss the role of bulkheads and watertight doors in maintaining ship stability.
- Describe the procedures and purpose of a propeller shaft survey.
- Calculate the transverse initial stability (GM) of a ship given the necessary data.
- Analyze the effects of flooding in a compartment on a ship's trim and stability.
- Explain the difference between static and dynamic stability and provide examples of each.
- Discuss the measures required to prevent and control corrosion and galvanic corrosion in ships.
- Outline the IMO regulations related to damaged ship stability.
- Describe the main structural components of a ship and their functions.
- Translate the following ship-related terms into proper maritime English: "ırgat," "halat vinci," "demir donanımı."

Materials Used in the Course

Textbooks and Reference Books:

- "Ship Construction" – David J. Eyres & George J. Bruce (Latest Edition)
- "Principles of Naval Architecture" – Volume II: Stability, Strength, and Design (SNAME)
- "Ship Hydrostatics and Stability" – Adrian Biran
- "Ship Design and Construction" – American Bureau of Shipping (ABS) Guide

Supplementary Reading:

- Research papers on ship hull optimization and stability
- IMO guidelines on damaged ship stability and safety regulations
- Case studies of recent shipbuilding projects

Software / Simulation Tools:

- Hydrostatic and stability calculation software (e.g., Maxsurf, NAPA)
- Structural analysis programs for ships (e.g., ANSYS, RhinoShip)
- Spreadsheet tools for hydrostatic and weight calculations

Other Materials:

- Ship lines plans, cross-sections, and midship plans
- Drafting and design templates
- Laboratory models or scaled ship sections for demonstration

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	2	2	2	3	3
PO2	2	2	2	2	2	2	2	3	2	2
PO3	3	3	3	3	3	2	2	2	3	3
PO4	2	2	2	3	3	2	2	2	2	3
PO5	3	3	3	3	3	3	2	3	3	3
PO6	2	2	2	2	2	3	2	2	2	2
PO7	1	1	2	2	2	1	1	2	1	2
PO8	1	1	1	1	1	1	1	1	1	1
PO9	1	1	1	1	1	1	1	1	1	1
PO10	1	1	2	2	2	1	1	2	1	2
PO11	1	1	1	1	1	1	1	1	1	1
PO12	1	1	1	1	1	1	1	1	1	1

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method**	**Assessment Method**
CLO1	Lecture, Multimedia Presentation, Hands-on Shipyard/Workshop Demonstration	Quizzes, Assignments, Practical Observations
CLO2	Lecture, Demonstration Videos, Lab Exercises on Welding and Inspection	Lab Reports, Quizzes, Practical Exams
CLO3	Lecture, Problem-Solving Sessions, Case Studies on Stability Calculations	Assignments, Midterm Exam, Practical Exercises
CLO4	Lecture, Simulation Exercises, Case Studies on Damaged Ship Stability	Case Study Reports, Assignments, Practical Exams
CLO5	Lecture, Ship Surveys Demonstration, Onboard Inspections	Practical Exams, Lab Reports, Assignments
CLO6	Lecture, Demonstration, Hands-on Maintenance Exercises	Assignments, Quizzes, Practical Exams
CLO7	Lecture, Workshops on Maritime English, Role-Playing	Oral Presentations, Written Assignments, Quizzes
CLO8	Lecture, Planning Exercises, Case Studies	Assignments, Group Projects, Practical Exercises
CLO9	Lecture, Case Studies, Group Discussions	Quizzes, Assignments, Participation
CLO10	Scenario-Based Exercises, Integration Projects, Case Studies	Project Reports, Practical Exams, Assignments

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**	**5**	**5**
Final Exam	**1**	**2**	**2**
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	**1**	**5**	**5**
Individual Reading / Research	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**79**
ECTS Credit			**2**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	15	10
Laboratory	-	-
Application	-	-
Field Work	-	-
Special Course Internship (Work Placement)	-	-
Homework/Assignments	1	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	**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: Latest Power and Propulsion Technologies							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
TEC409	IV	Fall	3	3	3	0	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 a comprehensive study of the latest developments in marine power generation and propulsion technologies. The course begins with a review of conventional thermodynamic cycles, including Rankine, Otto, Diesel, Sabathe, and Brayton cycles, and progresses to advanced internal combustion engine modifications aimed at higher efficiency and lower emissions. Students will explore alternative combustion strategies such as Atkinson and Miller cycles, HCCI, RCCI, RCSI, and hydrogen-fueled engines. The course also covers regulatory frameworks, including International Maritime Organization (IMO) regulations on carbon, NOX, and SOX emissions, and the application of exhaust gas treatment systems such as Selective Catalytic Reduction (SCR) and sulphur oxide filtration. In addition, students will study cutting-edge energy technologies, including fuel cells, semiconductors, photovoltaic conversion, nuclear batteries, and renewable power systems such as wind and water turbines. Osmotic power generation and pressure-retarded osmosis for freshwater production are also introduced. The course emphasizes alternative power and propulsion systems, including Kalina and Organic Rankine cycles, alternative fuels (LNG, methanol, ammonia, liquefied hydrogen, biodiesel, and biogas), and energy storage solutions in thermal, magnetic, and mechanical forms. Through applied case studies, students analyze the implications of alternative propulsion and energy systems in marine engineering, as well as the impact of IMO initiatives such as MEPC 82, Initial GHG Strategies, Carbon Intensity Indicator revisions, and the Global Fuel Standard. This course combines theoretical knowledge with practical applications, preparing students to evaluate, design, and implement modern power and propulsion solutions while adhering to environmental regulations and emerging technological trends.
Course Aims and Objectives	The aim of this course is to provide students with an in-depth understanding of modern power generation and propulsion technologies used in marine engineering. It emphasizes both theoretical principles and practical applications, highlighting innovations for improved efficiency, alternative fuels, and environmental compliance. The course also seeks to prepare students to analyze, evaluate, and apply advanced propulsion systems and alternative energy solutions within the context of international maritime regulations. • Understand and analyze conventional and modified thermodynamic cycles relevant to marine propulsion. • Explain alternative combustion strategies and their impact on engine efficiency and emissions reduction. • Apply knowledge of IMO environmental regulations and exhaust gas treatment systems to marine engineering solutions. • Describe the principles and applications of fuel cells, renewable energy systems, and other alternative power sources. • Evaluate energy storage solutions and alternative fuels for marine applications.

	• Conduct case studies on alternative propulsion and energy systems, integrating environmental and operational considerations. • Critically assess the performance, advantages, and limitations of emerging marine power and propulsion technologies.
Course Learning Outcomes	**LO1 – Knowledge and Understanding** Demonstrate knowledge of conventional and advanced marine power cycles (Rankine, Otto, Diesel, Sabathe, Brayton, Kalina, Organic Rankine) and alternative combustion strategies (HCCI, RCCI, RCSI, hydrogen engines). Understand international maritime environmental regulations (IMO MEPC, NOx/SOx limits, Carbon Intensity Indicator), exhaust gas treatment systems, alternative fuels, renewable energy sources, and energy storage solutions in marine propulsion. **LO2 – Application of Knowledge** Apply thermodynamic and environmental principles to assess the efficiency, operational feasibility, and environmental compliance of marine propulsion systems. Integrate energy storage solutions and renewable energy technologies into marine power and auxiliary systems. **LO3 – Analytical and Technical Skills** Analyze the performance of power cycles, combustion strategies, alternative fuels, exhaust gas treatment systems, and renewable energy technologies. Conduct energy efficiency calculations, safety evaluations, and environmental impact assessments. Perform case study analyses for propulsion system optimization. **LO4 – Evaluation and Critical Thinking** Critically evaluate emerging marine propulsion technologies, considering operational, economic, and environmental trade-offs. Assess alternative propulsion strategies and energy efficiency measures, recommending improvements for sustainable and efficient marine power systems. **LO5 – Communication and Interpretation** Communicate technical analyses, performance evaluations, and case study findings effectively through written reports, diagrams, and oral presentations, supporting informed decision-making in marine engineering contexts. **LO6 – Problem-Solving and Decision-Making** Develop problem-solving and decision-making skills to optimize marine propulsion and energy systems, implementing practical solutions for efficiency, environmental compliance, safety, and operational performance.

Content of the Course

Week	*Subject*
1	Review of conventional power cycles Rankine, Otto, Diesel, Sabathe and Brayton cycles
2	Modifications of internal combustion cycles for higher efficiencies and less harmful emissions a. Atkinson / Miller cycles b. Common rail injection schemes c. Homogeneous charge - compression ignition (HCCI) engines d. Reactivity-controlled compression ignition (RCCI) engines e. Reactivity-controlled spark ignition (RCSI) engines f. Hydrogen combustion engines
3	International Maritime Organization's rules for reduced Carbon emissions and NOX-SOX emissions and exhaust gas filtering systems – Selective catalytic reduction (SCR) and sulfur oxides filtration of exhaust gases
4	Fuel cells, theory and types
5	Theory of semiconductors and photovoltaic electric conversion, nuclear batteries
6	Wind turbines and water turbines
7	Osmotic power systems: Pressure-retarded osmosis (PRO) power generation and reverse-osmosis freshwater generation
8	Mid-Term Exam Application (where applicable)
9	Kalina and Organic Rankine cycles
10	Alternative fuels – LNG, Methanol, Ammonia, Liquefied Hydrogen, Biodiesel and Biogas.
11	Storage of energy in heat, magnetic and mechanical forms
12	Case Study 1: Alternative propulsion discussions in marine engineering
13	Case Study 2: Alternative energy discussions in marine engineering
14	Case Study 3: Discussions of IMO MEPC 82, Initial GHG Strategies (ISWG-GHG-17), Carbon Intensity Indicator (CII) revision, Global Fuel Standard (GFS) and greenhouse gas (GHG) Strategies and future of energy efficiency regulations
15	Final exam Application (Where applicable)

Methods and Techniques Used in the Course

Lectures – Detailed presentations on conventional and emerging power cycles, alternative fuels, propulsion technologies, and international regulations.

Case Studies – Real-world examples of marine propulsion systems, energy efficiency measures, and alternative power solutions.

Hands-on Applications – Practical exercises and simulations of propulsion systems, energy management, and emission control methods.

Problem-Solving Sessions – Analytical tasks, calculations, and scenario-based exercises related to energy efficiency, fuel consumption, and environmental compliance.

Group Discussions and Workshops – Collaborative learning on alternative fuels, renewable energy integration, and IMO regulatory compliance.

Independent Projects – Research and reporting on emerging technologies, GHG reduction strategies, and innovative propulsion systems.

Mid-term and Final Examinations – Assess understanding through theoretical and applied questions covering all course topics.

Multimedia Resources – Use of charts, diagrams, simulations, and videos to illustrate complex thermodynamic processes and energy systems.

Sample Questions

Short Answer / Conceptual Questions

- Explain the differences between Rankine, Otto, Diesel, and Brayton cycles in terms of efficiency and typical applications in marine engineering.
- Describe the working principle of Selective Catalytic Reduction (SCR) for reducing NOx emissions.
- Define Homogeneous Charge Compression Ignition (HCCI) and explain its advantages over conventional diesel engines.
- What are the key considerations for integrating fuel cells into marine propulsion systems?

Problem-Solving / Calculation Questions

- Calculate the thermal efficiency of an ideal Brayton cycle with given compressor and turbine inlet/outlet temperatures.
- Compare the energy output of a conventional Diesel engine and a reactivity-controlled compression ignition (RCCI) engine for the same fuel input.
- Determine the potential energy recovery from a Pressure-Retarded Osmosis (PRO) system given salinity and flow rate parameters.

Case Study / Analytical Questions

- Analyze a ship propulsion system scenario where LNG fuel is used instead of heavy fuel oil. Identify changes in emissions, efficiency, and engine design considerations.
- Discuss the challenges of implementing wind-assisted propulsion systems on modern cargo ships.
- Evaluate the impact of the IMO Carbon Intensity Indicator (CII) revisions on the operational strategy of a container shipping company.

Essay / Discussion Questions

- Discuss the advantages and limitations of alternative fuels such as ammonia, methanol, and hydrogen for marine propulsion.
- How can the integration of renewable energy sources and advanced power cycles contribute to reducing greenhouse gas emissions in shipping?
- Explain the potential future trends in marine power and propulsion technologies considering global environmental regulations.

Materials Used in the Course

Textbooks

- **"Marine Propulsion and Auxiliary Machinery"** – H.D. McGeorge, latest edition.
- **"Alternative Fuels and Advanced Propulsion Systems for Marine Applications"** – J. Carlton & M. Norrbin.
- **"Marine Engineering Economics and Technology"** – J. Taggart.
- **"Power Plant Engineering"** – P.K. Nag (for thermodynamic cycles and alternative power systems).

Reference Books

- **"Sustainable Marine Engineering and Green Propulsion Systems"** – Edited collection.
- **"Gas Turbines and Turbo Machinery"** – Dixon & Hall.
- **"Fuel Cells and Hydrogen Technologies in Marine Applications"** – O. Shukla.
- **IMO Publications: MEPC 82, ISWG-GHG Reports, Initial GHG Strategy Guidelines**.
- **Marine Renewable Energy Texts** (wind, wave, osmotic power systems).

Software / Simulation Tools

- **MATLAB / Simulink** – for modeling and simulating thermodynamic cycles.
- **Aspen HYSYS** – for fuel and energy system analysis.
- **Marine engine performance and emission simulation software** (various industry tools).
- **EEDI / CII calculation tools** – IMO guidelines compliance.

Journals / Articles

- **Journal of Marine Science and Technology**
- **Marine Technology Society Journal**
- **Applied Energy and Renewable Energy Journals** (for alternative fuels and energy efficiency studies).

Other Materials

- **Case studies and IMO regulatory reports** on carbon reduction strategies.
- **Lecture notes and practical manuals** for propulsion systems, turbo-machinery, and alternative energy applications.
- **Technical datasheets** of marine engines, fuel cells, and renewable energy devices.

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	3	2	2	3	2
PO2	2	3	3	2	2	3
PO3	2	2	3	3	2	3
PO4	1	2	2	2	3	3
PO5	1	2	3	3	2	3
PO6	2	3	3	2	2	3
PO7	1	1	2	2	2	2
PO8	1	2	2	2	1	2
PO9	1	1	1	2	2	2
PO10	2	2	3	3	2	3
PO11	1	2	2	2	2	3
PO12	1	1	2	2	2	3

Course Learning Outcomes/ Evaluation Method		
CLO	**Teaching Method (Instructional Strategy)**	**Assessment Method (Evaluation)**
CLO1 – Knowledge & Understanding	Lectures, Multimedia Presentations, Conceptual Discussions	Written Exams, Quizzes, Short Answer Questions
CLO2 – Application of Knowledge	Tutorials, Problem-Solving Sessions, Simulation Exercises	Homework Assignments, Practical Problem Sets, Lab Reports
CLO3 – Analytical & Technical Skills	Case Studies, Performance Analysis Workshops, Energy Cycle Simulations	Analytical Assignments, Case Study Reports, Problem-Solving Exams
CLO4 – Evaluation & Critical Thinking	Scenario-Based Learning, Comparative Evaluations, Group Discussions	Evaluation Reports, Case Study Presentations, Oral Assessments
CLO5 – Communication and Interpretation	Technical Writing Workshops, Report Preparation, Team Exercises	Project Reports, Presentations, Documentation Assessment
CLO6 – Problem-Solving and Decision-Making	Problem-Based Learning, Applied Engineering Tasks, Simulation Projects	Practical Problem-Solving Reports, Decision-Making Exercises, Capstone/Project Evaluation

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Preparation for lectures	**15**	**1**	**15**
Lectures	**15**	**3**	**45**
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	**3**	**3**	**9**
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			**96**
ECTS Credit			**3**

Evaluation System		
Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	3	15
Special Course Internship (Work Placement)	-	-
Homework/Assignments	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	1	15
Quiz	-	-
Midterms/Oral Exams	1	30
Final/Oral Exams	1	30
Total	**8**	**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: Technical Ship Management II							
Code	**Year**	**Semester**	**Credit**	**ECTS**	**Course application, Hour/Week**		
					Theoretical	**Application**	**Laboratory**
TSM401	IV	Fall	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**
				-	-	-	100
Course Venue and Time				Tuesday / 10:30 – 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	This course provides an in-depth study of modern ship management practices with a particular focus on survey procedures, regulatory compliance, and safety management standards. It introduces students to the theoretical foundations of the International Safety Management (ISM) Code, ship structural integrity, and the concept of fitness for service. The course covers the principles and applications of internal and external surveys, including regular and irregular inspections, as well as the roles of flag states, port states, classification societies, and third-party organizations in ensuring maritime safety and operational standards. Students will explore documentation and certification requirements, such as initial, annual, intermediate, renewal, and additional surveys, alongside practical methods for physical inspections of hulls, machinery, cargo spaces, and other ship compartments. Emphasis is placed on identifying and addressing non-conformities, deficiencies, detentions, and legal implications related to unfitness. Through real-world case studies and applications, students will develop the ability to prepare vessels for Port State Control (PSC), third-party vetting (OCIMF, CDI, SIRE, RightShip), and harmonized surveys (HSSC). The course also includes reporting strategies, performance evaluations, and continuous self-assessment techniques to maintain compliance with major international conventions and industry requirements (MARPOL, BWM, IBC, IMDG, ICS, ILO, MLC). Practical exercises and case studies guide students in applying survey principles, developing improvement strategies, and ensuring vessels are prepared for inspections by various regulatory and commercial bodies.
Course Aims and Objectives	The course aims to provide students with a comprehensive understanding of ship management, focusing on safety, operational efficiency, and regulatory compliance. It emphasizes the theoretical foundations and practical applications of the International Safety Management (ISM) Code, ship surveys, and inspection procedures. Students will gain knowledge of vessel documentation, classification, and certification requirements, as well as the roles of flag states, port states, classification societies, and third-party inspectors. Additionally, the course aims to develop students' ability to plan, conduct, and evaluate surveys, assess vessel fitness, and implement corrective actions to maintain operational standards. Through case studies and practical exercises, students will acquire the skills necessary for continuous monitoring, self-assessment, and improvement of shipboard operations in alignment with international conventions and industry standards. **Course Objectives** By the end of the course, students should be able to: • Understand the theoretical principles behind ship management, ISM Code implementation, and vessel fitness concepts.

	• Identify and explain the types of surveys (initial, annual, intermediate, periodical, renewal, and additional) and their purposes. • Demonstrate knowledge of the roles and responsibilities of flag states, port states, classification societies, and third-party inspection bodies. • Apply methods for inspecting hulls, machinery, cargo spaces, and other ship compartments, and evaluate the results. • Recognize non-conformities, deficiencies, detentions, and legal implications of unfitness, and propose corrective measures. • Prepare vessels for Port State Control (PSC), third-party vetting inspections, and harmonized surveys. • Develop reporting strategies, maintain documentation, and ensure compliance with international maritime conventions and industry requirements (e.g., MARPOL, BWM, IBC, IMDG, ICS, ILO, MLC). • Perform self-assessment and continuous improvement of shipboard operations using practical case studies and matrix evaluations.
Course Learning Outcomes	**CLO1:** Explain the principles of ship management and ISM Code implementation in relation to safety, quality, and environmental protection. **CLO2:** Identify and distinguish different types of surveys (initial, annual, intermediate, periodical, renewal, and additional) and their regulatory requirements. **CLO3:** Recognize the roles and responsibilities of maritime authorities including flag states, port states, classification societies, and third-party inspection bodies. **CLO4:** Conduct inspections and evaluate ship conditions, including hull, machinery, cargo spaces, and other compartments, applying appropriate measurement and testing methods. **CLO5:** Detect and analyze non-conformities and deficiencies, determine their legal and operational implications, and propose corrective actions. **CLO6:** Prepare and manage ships for inspections and audits, including Port State Control (PSC), third-party vetting, and harmonized surveys.

Content of the Course

Week	*Subject*
1	**General Aspects of Ship Management** Theory behind the ISM-Code, Overall reminder of ship's structure and equipment, concept of fitness.
2	Principles of the internal and external surveys, regular/irregular surveys. Understanding of authorities: Flag state/port state, classification societies/class surveyor, insurance survey, 3'rd parties/3'rd party inspections and self-assessment
3	Registered documentational requirements and ship certificates, Initial survey, Annual Survey, Intermediate survey, periodical survey, renewal survey, additional surveys
4	Control methods of a physical survey of the hull and machinery, docking, tank inspections, test methods, inspection of: Machinery spaces, cargo area, other compartments, engines, running parts, measurement control methods, and reporting
5	Non-conformities, deficiencies, detention and arrest: Legal aspects of un-fitness and limitations, reporting, rectifications and clearance
6	**Case study 1** Preparation/keeping a ship "fit" for a Port State Control (PSC)
7	**Case Study 2** Self-assessment of the ship crew and continuous survey onboard
8	**Mid-term** Application (Principles of survey and requirements)
9	Performance evaluation of the ships by 3'rd parties & vetting's: Oil majors (OCIMF/CDI, SIRE), Right Ship, SIGTTO, port, harbor and terminal inspections
10	Reporting strategies, rectifications & certifications
11	**Case study 1** Preparation/keeping a ship "fit" for a 3'rd party inspections
12	**Case Study 2** Continuous survey and harmonized survey (HSSC) & certifications
13	**Case study 3** Conventional industrial requirements, MoU's, Flag state, Recognized parties and matching standards (MARPOL, BWM, IBC, IMDG, ICS, ILO, MLC etc)
14	Keeping ready and strategies for improvement / advanced applications
15	**Final Exam** Application (Self-assessment and preparation of matrixes)

Methods and Techniques used in the Course

Lectures – Interactive lectures to present the theoretical background of ship management, ISM Code, surveys, and inspections.

Case Studies – Analysis of real-life and hypothetical scenarios to understand survey preparation, vetting, and self-assessment procedures.

Practical Exercises / Applications – Hands-on exercises simulating inspection checklists, hull/machinery surveys, and certificate tracking.

Group Work – Collaborative tasks for problem-solving, such as developing ship compliance matrices or survey preparation plans.

Assignments – Written assignments to reinforce theoretical concepts and apply them to practical ship management scenarios.

Projects – Extended project work to develop comprehensive strategies for maintaining ship fitness, safety, and regulatory compliance.

Mid-term and Final Evaluations – Combination of written and practical exams to assess theoretical understanding and application skills.

Presentations – Student presentations on case studies, survey procedures, or improvements in ship management practices to foster communication skills.

Sample Questions

Theoretical Questions

- Explain the main objectives of the ISM Code and how it ensures safety and environmental protection on board.
- Describe the roles and responsibilities of flag states, port states, and classification societies in ship management.
- Compare initial, annual, intermediate, and renewal surveys of a vessel. What are the key differences in scope and procedures?
- Discuss the types of non-conformities that may be identified during a survey and the legal implications of un-fitness for a ship.
- Explain the concept of self-assessment on board and its importance in continuous survey practices.

Practical / Application Questions

- Given a sample ship's machinery and hull inspection checklist, identify potential deficiencies and propose corrective actions.
- Prepare a survey preparation plan for a Port State Control inspection, including necessary documents, crew training, and reporting strategies.
- Evaluate a mock vetting report from a 3rd party inspection (e.g., OCIMF SIRE) and identify the areas that require improvement for compliance.
- Create a matrix to track all statutory and class certificates of a vessel, indicating the next inspection and renewal dates.
- Using a case study, perform a self-assessment of the ship crew and onboard continuous survey practices, highlighting key areas for improvement.

Materials Used in the Course

Textbooks and References

- International Safety Management (ISM) Code – IMO publication
- Ship Surveying and Certification – P. Jackson, Nautical Institute
- Port State Control Guide – IACS / Paris MoU
- Marine Surveying: Principles and Practice – D.J. House
- Maritime Legislation & Regulations – IMO, national maritime authorities

Journals and Articles

- *The Nautical Institute Journal*
- *Marine Policy*
- Case studies from recent Port State Control inspections
- Industry vetting reports (OCIMF, RightShip, SIGTTO)

Software and Tools

- Ship inspection checklist templates (digital / Excel)
- Survey reporting tools (e.g., Vetting forms, PSC checklists)
- Simulation software for hull, machinery, and cargo inspections

Additional Materials

- IMO conventions and codes: SOLAS, MARPOL, IBC, IMDG, ISM, MLC
- Sample survey reports
- Ship certificates and document examples (registration, class, statutory certificates)
- Guidelines from classification societies and recognized organizations

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**	**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)	-	-	-
Research for Project(s)/Essay(s)	-	-	-
Project Writing	**2**	**5**	**10**
Group Work	**1**	**4**	**4**
In-class Discussion(s)	-	-	-
Quiz(es)	-	-	-
Preparation for Quiz(es)	-	-	-
Laboratory	**3**	**2**	**6**
Assignment(s)/Homework/Class Works	**2**	**3**	**6**
Individual Reading / Research	-	-	-
Lesson Planning	-	-	-
Materials Adaptation	-	-	-
Material Development	-	-	-
Draft Preparation	-	-	-
Drawing	-	-	-
Essay Writing	-	-	-
Tutorial(s)	-	-	-
Portfolio Preparation	-	-	-
Portfolio Presentation	-	-	-
Total Workload			**102**
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	2	10
Providing reliability and motivation of the individual homework completion and Submission	-	-
Presentation/Jury	-	-
Project	2	10
Quiz	-	-
Midterms/Oral Exams	1	20
Final/Oral Exams	1	40
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.		