SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Research & Design Internship 4**						
2.2 Lecture organizer							
2.3 Internship organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**V**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	9	where: 3.2 lecture	-	3.3 internship	9
3.4 Total hours in the curriculum	126	where: 3.5 lecture	-	3.6 internship	126
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					12
Further documentation in libraries, on specialized electronic platforms and fieldwork					10
Preparing assignments, portfolios					14
Tutorials					10
Examinations					4
Other activities:					-

3.7 Total hours of individual study	50
3.9 Total hours per semester	176
3. 10 Number of credits	8

4. Prerequisites (where relevant)

4.1 curriculum related	• Disciplines from the bachelor's degree in Naval Architecture / Mechanical Engineering. • Full assisted disciplines from the Naval Architecture Master.
4.2 competence related	• Define, analyze, and use appropriate research and design systems.

5. Conditions (where relevant)

5.1. of the lecture	• -
5.2. of the internship	• Experimental and numerical laboratories within the Research Center "Naval Architecture", experimental equipment, computers, software, Internet access, bibliographic sources. • Research and design laboratories at partner internship companies.

6. Specific competences acquired	
Professional competences	**C4 Advanced design of ship structures – 1 credit** **C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding.– 2 credits** **C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 2 credits**
Transversal competences	**CT1 Fulfilment in due time of the design and/or the research activities in naval architecture – 1 credit** **CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture – 1 credit** **CT3 Assessment of the need for professional training, in the context of the evolution of the field – 1 credit**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C4.1 Defining and specifying methods, techniques and procedures for describing concepts specific to the advanced design of ship structures. C4.2 Classification and use of methods, techniques and procedures for analyzing concepts specific to advanced design of new ship structures. C5.1 In-depth knowledge, analysis and synthesis of naval technologies. C5.2 Use of information sources and specialized knowledge for the analysis, evaluation and selection of technological solutions imposed in new situations. C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions. CT1 Fulfilment in due time of the design and/or the research activities in naval architecture CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture CT3 Assessment of the need for professional training, in the context of the evolution of the field
7.2 Specific aims	C4.3 Apply the appropriate methods and techniques for the advanced design of ship structures under incomplete information to solve new theoretical problems. C4.4 Evaluate and interpret data specific to the advanced design of ship structures to substantiate constructive decisions. C4.5 Making models and designing projects that use innovative qualitative and quantitative methods specific to the advanced ship structures design. Developing projects using concepts specific to the advanced design of ship structures. C5.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C5.4 Applying algorithms to assess the performance of new technologies to improve decision making. C5.5 Innovative use of specific technologies for the purpose of project development. C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
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8.2 Internship	Teaching method	Observations Number of hours
1. Comparison of theoretical, numerical, technological and / or experimental results	Research and design	126 hours
2. Highlighting innovative solutions applied in theoretical, numerical, technological and / or experimental modeling		
3. Highlighting the optimal solutions applied in solving the research topic		
4. Conclusions of theoretical, numerical, technological and / or experimental research		
5. Future directions applicable to solving the research topic		
6. Research-design internship report		

Bibliography

1. Amoraritei, M., ”Complements of Marine Propellers Hydrodynamics in Non-uniform Flow”, Galati Univ. Press, 2008
2. Andersson, B., Andersson, R., Hakansson, L., Mortensen, M., Sudiyo, R., van Wachem, B., ”Computational Fluid Dynamics for Engineers”, Cambridge University Press, 2012
3. Betram, V., “Practical Ship Hydrodynamics”, (Ed.II) Butterworth Heinemann, Oxford, 2012
4. Babicz, J., “Wärtsilä Encyclopedia of Ship Technology“, Wärtsilä Corporation, Second Edition, Helsinki, 2015
5. Breslin, J.,P., ”Hydrodynamics of Ship Propeller”, Cambridge University Press, 2003
6. BV, „Rules for Classification and Construction”, Bureau Veritas, 2023
7. Carlton, J., S., ”Marine Propellers and Propulsion”, Elsevier, 2006
8. Domnisoru, L., “Structural Analysis and Hydroelasticity of Ships”, The „Dunărea de Jos” University Foundation Publishing House, Galati, 2006
9. Domnisoru, L., Lungu, A., Dragomir, D., Ioan, A., „Complements of Structural Analysis and Ship Hydrodynamics”, Galati University Press, 2008
10. DNV-GL., “Rules for Classification and Construction”, Det Norske Veritas & Germanischer Lloyd, 2023
11. Dragomir, D., Lungu, A., Domnisoru, L., „Naval Architecture Design Complements”, „Didactic and Pedagogic” Publising House, Bucharest, 2007
12. Eyres, D.J., „Ship Construction”, Elsevier Butterworth-Heinemann, New York, 2007
13. Ferziger, J.H., Peric, M., ”Computational Methods for Fluid Dynamics”, Springer-Verlag, Third Edition, 2002
14. Ghose, J., P., Gokarn, R., P., ”Basic Ship Propulsion”, New Delhi, 2004
15. Hadar, A., „Multilayer Composite Materials”, Academy and AGIR Publishing House, Bucharest, 2002
16. Hadar,A., Marin,C., Petre,C., Voicu,A., " Numerical Methods in Engineering ", Politehnica Press, Bucharest, 2005
17. Hirsch, C., ” Numerical Computation of Internal and External Flows: The Fundamentals of Computational Fluid Dynamics”, Butterworth-Heinemann, 2007
18. ISO 6954:2000, "Mechanical vibration — Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/obp/ui/#iso:std:iso:6954:ed-2:v1:en
19. ISO 20283-5:2016, "Mechanical vibration — Measurement of vibration on ships — Part 5: Guidelines for measurement, evaluation and reporting of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/ obp/ui/#iso:std:iso:20283:-5:ed-1:v1:en
20. Lewandowski, E.M., „The Dynamics of Marine Craft”, World Scientific, New Jersey, 2004
21. LR, “Ship Vibration and Noise. Guidance Notes”, Lloyd's Register, London, 2023
22. Lungu, A., (Ed) “Numerical Modeling in Engineering”, Academica Press, Galati, 2001
23. Mandal, N.R., ” Ship Construction and Welding”, Springer Nature Singapore Pte Ltd., 2017
24. Mansour, A., Liu, D., „Strength of Ships and Ocean Structures, The Principles of Naval Architecture Series, SNAME, New Jersey, 2008
25. Mocanu, C., "Strength of Materials", „Dunărea de Jos” University Foundation Publishing House, Galati, 2005
26. Obreja, D., “ Ship theory. Concepts and Methods of Navigation Performance Analysis”, „Didactic and Pedagogic” Publishing House, Bucharest, 2005
27. Okumoto, Y., Takeda, Y., Mano, M., Okada, T., “Design of Ship Hull Structures - A Practical Guide for Engineers”, Springer-Verlag, 2009

28. Paik, J.K., Thayamballi, A.K., „Ship Shaped Offshore Installations", Cambridge University Press, 2007
29. Rao, S.S., "The Finite Element Method in Engineering", Elsevier Science & Technology Books,, New York, 2004
30. Rawson, K.J., Tupper E.C., „Basic Ship Theory", (2 vol) Butterworth Heinemann, Oxford, 2001
31. Rodolfo, A., White, J., "Dynamic Scheduling with Microsoft Project", International Institute for Learning, 2011
32. Serban, D., Gavan, E., "Shipbuilding and Welding Technology", Evrika Publishing House, Brăila, 2001
33. Spyridon, E.H., Chunhua, Ge, "Review & Introduction to Hydroelasticity of Ships", Lloyd's Register, London , 2005
34. Stoicescu, L., "Strength of Materials", Evrika Publishing House, Braila, 2 vol., 2004
35. Storch, R.L., Hammon, C.P., Bunch, H.M. & Moore, R.C., "Ship production", Cornell Maritime Press, 2000
36. Schull, P.J., "Nondestructive Evaluation - Theory, Techniques, and Applications", Marcel Dekker, New York, 2001
37. Versteeg, H., Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Prentice Hall, 2007
38. Vlase, S. , „Composite Materials. Numerical Methods , "Transilvania" University Publishing House, Brașov, 2007
39. Vorus, W.S., „Vibration", The Principles of Naval Architectures Series, SNAME, New Jersey, 2010
40. Zienkiewicz, O.C., Taylor, R.L.,"The Finite Element Method" (3 Vol.), Elsevier Butterworth-Heinemann, Oxford, 2000

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The training includes the basic elements for integrating the graduate in the activities of the shipbuilding research and design companies, as well as for Bologna III PhD studies.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	---	---	---
10.5 Internship	Applying specialized knowledge in research and design activities	- Evaluating the weekly research-design internship that quantifies the rhythmic involvement and accuracy of the results. - Evaluation of the research-design internship report.	70% 30%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- The student should pass the current activities in the research and design internship. - The student should pass with the grade 5 the examination of the research-design internship report.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Research for Master Thesis**						
2.2 Lecture organizer							
2.3 Internship organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**V**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	5	where: 3.2 lecture	-	3.3 research for master thesis	5
3.4 Total hours in the curriculum	70	where: 3.5 lecture	-	3.6 research for master thesis	70
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					4
Further documentation in libraries, on specialized electronic platforms and fieldwork					4
Preparing chapters for the master thesis					14
Tutorials					4
Examinations					2
Other activities:					-

3.7 Total hours of individual study	28
3.9 Total hours per semester	98
3. 10 Number of credits	5

4. Prerequisites (where relevant)

4.1 curriculum related	• Disciplines from the bachelor's degree in Naval Architecture / Mechanical Engineering. • Full assisted disciplines from the Naval Architecture Master.
4.2 competence related	• Define, analyze, and use appropriate research and design systems.

5. Conditions (where relevant)

5.1. of the lecture	• -
5.2. of the internship	• Experimental and numerical laboratories within the Research Center "Naval Architecture", experimental equipment, computers, software, Internet access, bibliographic sources. • Research and design laboratories at partner internship companies.

6. Specific competences acquired

Professional competences	**C2 Hydrodynamic optimization of the hull forms – 1 credit** **C3 Propulsion system design – 1 credit** **C4 Advanced design of ship structures – 1 credit** **C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding – 1 credit** **C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 1 credit**
Transversal competences	**---**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C2.1 Detailing the methods, techniques and procedures for describing the concepts related to the hull forms optimization. C2.2 Explaining and sensing the applied hydrodynamics knowledge to the particular problem of a ship hull regardless of its geometry. C3.1 Description of the propulsion systems and of the technical vocabulary specific to the domain of naval architecture. C3.2 Efficient use of the acquired knowledge for explaining and interpreting the propulsion system working regimes. C4.1 Defining and specifying methods, techniques and procedures for describing concepts specific to the advanced design of ship structures. C4.2 Classification and use of methods, techniques and procedures for analyzing concepts specific to advanced design of new ship structures. C5.1 In-depth knowledge, analysis and synthesis of naval technologies. C5.2 Use of information sources and specialized knowledge for the analysis, evaluation and selection of technological solutions imposed in new situations. C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions.
7.2 Specific aims	C2.3 Complete use of the conceptual and methodologic apparatus to solve specific hydrodynamics problems related to the optimal design of the hull forms. C2.4 Applying criteria and evaluation methods with which the hull forms can be improved. C2.5 Argumentation by models and projects of the most appropriate methods for defining the optimal forms from a hydrodynamic point of view. C3.3 Identifying adequate methods, techniques, and procedures for the design of the propulsion systems under the incomplete documentation condition. C3.4 Data analysis to formulate value judgments and substantiate constructive decisions specific to propulsion systems design. C3.5 Conduct studies that use innovatory a wide range of quantitative methods specific to propulsion systems design. C4.3 Apply the appropriate methods and techniques for the advanced design of ship structures under incomplete information to solve new theoretical problems. C4.4 Evaluate and interpret data specific to the advanced design of ship structures to substantiate constructive decisions. C4.5 Making models and designing projects that use innovative qualitative and quantitative methods specific to the advanced ship structures design. Developing projects using concepts specific to the advanced design of ship structures. C5.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C5.4 Applying algorithms to assess the performance of new technologies to improve decision making. C5.5 Innovative use of specific technologies for the purpose of project development. C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
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8.2 Internship	Teaching method	Observations Number of hours
Research and design themes in the field of naval architecture, specific to master program, individualized for each master student, which addresses the following main directions: ship hydrodynamics (CFD), ship dynamics (resistance, maneuverability, seakeeping and hydroelasticity), dynamics of ship propulsion systems, ship structures analysis (FEM), offshore systems and units, ship integrated CAD / CAM / CAE systems, experimental noise and vibration analysis, advanced shipbuilding technologies, marine environmental protection, project management technologies. The master thesis will include the following main chapters: -Formulation of the research theme -Presenting the state of art of knowledge in the field of research -Presentation of the theoretical, numerical, experimental, technological study methods applied for the development of the research theme -Achieving the theoretical, numerical, experimental, technological model within the research theme -Case studies corresponding to the master thesis theme -Conclusions of the theoretical, numerical, experimental, technological researches - Bibliographical reference	Research and design	70 hours

Bibliography

1. Amoraritei, M., ”Complements of Marine Propellers Hydrodynamics in Non-uniform Flow”, Galati Univ. Press, 2008
2. Andersson, B., Andersson, R., Hakansson, L., Mortensen, M., Sudiyo, R., van Wachem, B., ”Computational Fluid Dynamics for Engineers”, Cambridge University Press, 2012
3. Betram, V., “Practical Ship Hydrodynamics”, (Ed.II) Butterworth Heinemann, Oxford, 2012
4. Babicz, J., “Wärtsilä Encyclopedia of Ship Technology“, Wärtsilä Corporation, Second Edition, Helsinki, 2015
5. Breslin, J.,P., ”Hydrodynamics of Ship Propeller”, Cambridge University Press, 2003
6. BV, „Rules for Classification and Construction”, Bureau Veritas, 2018
7. Carlton, J., S., ”Marine Propellers and Propulsion”, Elsevier, 2006
8. Domnisoru, L., “Structural Analysis and Hydroelasticity of Ships”, The „Dunărea de Jos” University Foundation Publishing House, Galati, 2006
9. Domnisoru, L., Lungu, A., Dragomir, D., Ioan, A., „Complements of Structural Analysis and Ship Hydrodynamics”, Galati University Press, 2008
10. DNV-GL., “Rules for Classification and Construction”, Det Norske Veritas & Germanischer Lloyd, 2018
11. Dragomir, D., Lungu, A., Domnisoru, L., „Naval Architecture Design Complements”, „Didactic and Pedagogic” Publising House, Bucharest, 2007
12. Eyres, D.J., „Ship Construction”, Elsevier Butterworth-Heinemann, New York, 2007
13. Ferziger, J.H., Peric, M., ”Computational Methods for Fluid Dynamics”, Springer-Verlag, Third Edition, 2002
14. Ghose, J., P., Gokarn, R., P., ”Basic Ship Propulsion”, New Delhi, 2004
15. Hadar, A., „Multilayer Composite Materials”, Academy and AGIR Publishing House, Bucharest, 2002
16. Hadar,A., Marin,C., Petre,C., Voicu,A., " Numerical Methods in Engineering ", Politehnica Press, Bucharest, 2005
17. Hirsch, C., ” Numerical Computation of Internal and External Flows: The Fundamentals of Computational Fluid Dynamics”, Butterworth-Heinemann, 2007
18. ISO 6954:2000, "Mechanical vibration — Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/obp/ui/#iso:std:iso:6954:ed-2:v1:en
19. ISO 20283-5:2016, "Mechanical vibration — Measurement of vibration on ships — Part 5: Guidelines for measurement, evaluation and reporting of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/ obp/ui/#iso:std:iso:20283:-5:ed-1:v1:en
20. Lewandowski, E.M., „The Dynamics of Marine Craft”, World Scientific, New Jersey, 2004

21. LR, “Ship Vibration and Noise. Guidance Notes”, Lloyd's Register, London, 2006
22. Lungu, A., (Ed) “Numerical Modeling in Engineering”, Academica Press, Galati, 2001
23. Mandal, N.R., ” Ship Construction and Welding”, Springer Nature Singapore Pte Ltd., 2017
24. Mansour, A., Liu, D., „Strength of Ships and Ocean Structures, The Principles of Naval Architecture Series, SNAME, New Jersey, 2008
25. Mocanu, C., "Strength of Materials", „Dunărea de Jos” University Foundation Publishing House, Galati, 2005
26. Obreja, D., “ Ship theory. Concepts and Methods of Navigation Performance Analysis”, „Didactic and Pedagogic” Publishing House, Bucharest, 2005
27. Okumoto, Y., Takeda, Y., Mano, M., Okada, T., “Design of Ship Hull Structures - A Practical Guide for Engineers”, Springer-Verlag, 2009
28. Paik, J.K., Thayamballi, A.K., „Ship Shaped Offshore Installations”, Cambridge University Press, 2007
29. Rao, S.S., “The Finite Element Method in Engineering”, Elsevier Science & Technology Books,, New York, 2004
30. Rawson, K.J., Tupper E.C., „Basic Ship Theory”, (2 vol) Butterworth Heinemann, Oxford, 2001
31. Rodolfo, A., White, J., “Dynamic Scheduling with Microsoft Project”, International Institute for Learning, 2011
32. Serban, D., Gavan, E., “Shipbuilding and Welding Technology”, Evrika Publishing House, Brăila, 2001
33. Spyridon, E.H., Chunhua, Ge, “Review & Introduction to Hydroelasticity of Ships”, Lloyd’s Register, London , 2005
34. Stoicescu, L., "Strength of Materials", Evrika Publishing House, Braila, 2 vol., 2004
35. Storch, R.L., Hammon, C.P., Bunch, H.M. & Moore, R.C., “Ship production”, Cornell Maritime Press, 2000
36. Schull, P.J., “Nondestructive Evaluation - Theory, Techniques, and Applications”, Marcel Dekker, New York, 2001
37. Versteeg, H., Malalasekera, W., ”An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, Prentice Hall, 2007
38. Vlase, S. , „Composite Materials. Numerical Methods , “Transilvania” University Publishing House, Braşov, 2007
39. Vorus, W.S., „Vibration”, The Principles of Naval Architectures Series, SNAME, New Jersey, 2010
40. Zienkiewicz, O.C., Taylor, R.L.,”The Finite Element Method” (3 Vol.), Elsevier Butterworth-Heinemann, Oxford, 2000

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The training includes the basic elements for integrating the graduate in the activities of the shipbuilding research and design companies, as well as for Bologna III PhD studies.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	---	---	---
10.5 Research for master thesis	Applying specialized knowledge in research and design activities	- Evaluating the weekly activity of research for master thesis that quantifies the rhythmic involvement and accuracy of the results. - Final evaluation of the master thesis.	30% 70%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- The student should pass with grade 5 the current activities for the master thesis. - The student should pass the final evaluation of the dissertation with the grade 5.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Master Thesis Defense**						
2.2 Lecture organizer							
2.3 Internship organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**E**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	-	where: 3.2 lecture	-	3.3 master thesis defense	-
3.4 Total hours in the curriculum	-	where: 3.5 lecture	-	3.6 master thesis defense	-
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					-
Further documentation in libraries, on specialized electronic platforms and fieldwork					-
Preparing assignments, portfolios					-
Tutorials					-
Examinations					-
Other activities:					-

3.7 Total hours of individual study	-
3.9 Total hours per semester	-
3. 10 Number of credits	10

4. Prerequisites (where relevant)

4.1 curriculum related	• Disciplines from the bachelor's degree in Naval Architecture / Mechanical Engineering. • Full assisted disciplines from the Naval Architecture Master.
4.2 competence related	• Define, analyze, and use appropriate research and design systems.

5. Conditions (where relevant)

5.1. of the lecture	• -
5.2. of the internship	• exam room, video projector, computer

6. Specific competences acquired

Professional competences	**C1 Preliminary design of ship's hydrodynamic forms** **C2 Hydrodynamic optimization of the hull forms** **C3 Propulsion system design** **C4 Advanced design of ship structures** **C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding** **C6 In-depth knowledge and development of materials and technologies used in offshore engineering**
Transversal competences	**CT1 Fulfilment in due time of the design and/or the research activities in naval architecture.** **CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture.** **CT3 Assessment of the need for professional training, in the context of the evolution of the field.**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	According to the master thesis theme specific to each master student
7.2 Specific aims	According to the master thesis theme specific to each master student

8. The content of the master thesis defense - thematic of the master thesis projects

8.2 Examples of master thesis topics of the Naval Architecture Master program (2023-2024)	Observations
1.Tension – Leg platforms. Description. Dynamic behavior in waves. installation procedure	Individual themes for each master
2.Technological processes mounting and testing the mooring systems on offshore unit	
3.Technology of mounting the steering gear system. Testing methodology of the steering gear system	
4.Analysis of stress level for connection of dredging suction pipe with hull	
5. Numerical global-local strength analysis of a river-barge in head equivalent design wave loads by a 3D-FEM model	
6. The floating structure for a wind farm in the Black Sea	
7. The floating turbine for energy generation om rivers	
8. The floating structure for wave energy recovery systems	
9.Assembly technology of the ship in terms of project management	
10. Ship outfitting process from a project management perspective	
11.Analysis of ship propulsion performances for a containership taking into account EEDI requirements.	
12.Hydrodynamic performances investigation for a chemical tank propeller	
13.Numerical analysis of added resistance in regular head waves	
14.Hydrodynamic investigations on a multihull vessel	
15. Solutions for improving ship hull hydrodynamic performance	
16. Hydrodynamic characteristics of a self-propelled inland ship	
17. Numerical hydrodynamic analysis of a spar platform subjected to irregular waves	
18. Numerical hydrodynamic analysis of a AHTS vessel in irregular waves	
19. Pre-outfitting in the assembly stage for a container ship build in Damen Shipyards Mangalia	
20. Construction and mounting of aluminum superstructure for a trawler built in Vard Tulcea	
21. Simulation of block erection process for a chemical tanker built in Damen Shipyards Mangalia	
22. Assembling procedure for the fore peak block – Damen Shipyards Galati	
23.The impact of the quality control into the production process	
24.Methods of improving the economic efficiency of the storing the equipment on board of the vessel prior to the commissioning process.	
25.The impact of the cleaning activities against the economic efficiency of the production process	
26.Methods of improving the economic efficiency of the commissioning process during HAT	
27.Bilge Injection System for Sludge Incinerator Onboard of an Oil Tanker	
28. SEVAN Hull Design for FPSOs	
29. The Technology role in Green Ships	
30. Offshore Support Vessel Design — Pipe Lay Vessels	
31. Robotic Welding System for Shipbuilding	
32. Local vibrations on board river ship	
33. Noise assessment for a river vessel	

Bibliography

According to the theme of research-design in the fields of: ship hydrodynamics (CFD), ship dynamics (resistance, maneuverability, seakeeping and hydroelasticity), ship propulsion dynamics, ship structures analysis, offshore systems and units, integrated CAD / CAM / CAE systems, experimental noise and vibration analysis, advanced shipbuilding technologies, marine environmental protection, project management technologies.

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The training includes the basic elements for integrating the graduate in the activities of the shipbuilding research and design companies, as well as for Bologna III PhD studies.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	---	---	---
10.5 Master thesis defense	- The quality of the master thesis project - The quality of the presentation of the master thesis project and the answers to the questions formulated by the exam committee	According to the regulations for final exam of the master's degree studies at "Dunarea de Jos" University of Galati - The arithmetic average of the rating grades of each member of the exam committee.	100%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- Integration of specialized knowledge (master thesis project) - Minimum grade 6			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Computational Fluid Dynamics 2**						
2.2 Lecture organizer							
2.3 Project organizer							
2.4 Year of study	**II**	**2.5 Semester**	I	**2.6 Type of assessment**	**E+P**	**2.7 Type of subject**	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	4	where: 3.2 lecture	2	3.3 project	2
3.4 Total hours in the curriculum	56	where: 3.5 lecture	28	3.6 project	28
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					20
Further documentation in libraries, on specialized electronic platforms and fieldwork					8
Preparing seminars / labs, assignments, essays, portfolios and essays					3
Tutorials					1
Examinations					2
Other activities					0

3.7 Total hours of individual study	34
3.9 Total hours per semester	90
3. 10 Number of credits	3+3

4. Prior learning / Prerequisites (where relevant)

4.1 curriculum-related	– None
4.2 competence-related	– None

5. Conditions (where relevant)

5.1. of the lecture	– The right of sustaining the final examination is strictly conditioned by the delivery in due time of the project, as well as by getting at least the established minimum mark for it.
5.2. of the project	– The student attendance of all the scheduled project classes is compulsory.

6. Specific competences acquired

Professional competences	**C2 Hydrodynamic optimization of the hull forms – 6 credits**
Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C2.1 Detailing the methods, techniques and procedures for describing the concepts related to the hull forms optimization; C2.2 Explaining and sensing the applied hydrodynamics knowledge to the particular problem of a ship hull regardless of its geometry; • The subject strong formative character for the graduate acting either as a practicing engineer in a shipyard or as a researcher in the naval engineering domain. It contributes for the graduate at building up the expertise in the field of numerical simulation of the hydrodynamic processes that describe the unsteady flow around the ship hull.
7.2 Specific aims	C2.3 Complete use of the conceptual and methodologic apparatus to solve specific hydrodynamics problems related to the optimal design of the hull forms; C2.4 Applying criteria and evaluation methods with which the hull forms can be improved; C2.5 Argumentation by models and projects of the most appropriate methods for defining the optimal forms from a hydrodynamic point of view; • Developing skills for the fundamental-applied research skills in naval architecture; • Developing the fundamentals of the naval architecture and acquiring a good practice in using the most advanced techniques in research and design both in Romanian and English; • Developing the capacity of a performant fulfilling in due time of the research, design, planning, coordination and control tasks that occur in the daily activity of an engineer; • Developing the capacity of using the computer; • Developing the capacity for numerical simulation of specific hydrodynamic and structural resistance problems; • Developing the capacity of acquiring, processing and interpretation of the experimental data; • Developing the capacity of performing in complex and multicultural working teams; • Developing skills in efficient communication in English either face-to-face, or by making use of the modern techniques; • Developing the capacity for quick and efficient adaption in a variety of companies such as research entities, universities, institutes of the Academy and so on.

8. Contents

8. 1 Lecture	Teaching method	Observations
Numerical simulation of the boundary layer flow – Thin boundary layer theory. Overview; – Determination of the configuration of the current lines; – Boundary layer equations integration; – Boundary conditions.	S PowerPoint slides displayed on the intelligent board	(4 hours)
Numerical solutions of the Navier-Stokes and continuity equations – Mathematical Model; – Meshing with finite differences; – Treatment of convective terms; – Artificial viscosity.	PowerPoint slides displayed on the intelligent board	(10 hours)
Formulation of boundary conditions. Modeling of free surface. – types of boundary conditions; – inflow boundary; – outflow boundary; – solid boundary; – symmetry boundaries.	PowerPoint slides displayed on the intelligent board	(6 hours)
Particular flow boundary conditions with free surface – Kinematic and dynamic conditions conditions; – Euler and Lagrange formulation for kinematic conditions; – Wave absorbers.	PowerPoint slides displayed on the intelligent board	(1 hour)
Modeling of turbulent flow – Turbulence models: – Models with 0 equations: – Cebecci-Smith; – Models with 1 equation: – Baldwin-Lomax; – Spallart-Almaras; – Models with 2 equations: – K-ε and K-ω models.	PowerPoint slides displayed on the intelligent board	(7 hours)

References

1. Roache, P.J., “Computational Fluid Dynamics”, Hermosa Publishers, 1976
2. Anderson, D.A., Tannehill, J.C., Pletcher, R.H., “Computational Fluid Mechanics and Heat Transfer” Mc. Graw-Hill, 1983
3. Fletcher, C.A.J., “Computational Techniques for Fluid Dynamics”, Vols. I & II, Springer-Verlag, 1988
4. Hoffman, K.A., Chiang, S.T., “Computational Fluid Dynamics for Engineers”, Vols. I & II, Engineering Education system, 1993
5. Lungu, A., (Editor), “Lectures in Numerical Simulation in Engineering”, Academica Press, 2001;
6. Ferziger, J.H., Peric, M., ”Computational Methods for Fluid Dynamics”, Springer-Verlag, Third Edition, 2002
7. Versteeg**,** H., Malalasekera**,** W., ”An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, Prentice Hall, 2007
8. Andersson, B., Andersson, R., Hakansson, L., Mortensen, M., Sudiyo, R., van Wachem, B., ”Computational Fluid Dynamics for Engineers”, Cambridge University Press, 2012
9. Hirsch, C., ” Numerical Computation of Internal and External Flows: The Fundamentals of Computational Fluid Dynamics”, Butterworth-Heinemann, 2007

8. 2 Project	Teaching method	Observations
Introducing XGRID, XVISC and XCHAP computational modules of the Shipflow software package.	Based on the use of the minimal reference list as well as on the user manuals of the software products used in the classes (Shipflow, Tribon, Tecplot)	1:**(2 hours)**
Meshing of the computational domain by using XGRID in order to perform the numerical simulation of the viscous flow.		2:**(2 hours)**
Correction of mesh resolution in.		3:**(2 hours)**
Numerical calculation of the steady viscous flow around the ship hull by using the XVISC module of Shipflow.		4:**(2 hours)**
Numerical simulation of the steady viscous free-surface flow around the ship hull without appendages and without propeller by using the XCHAP module of Shipflow.		5-6:**(4 hours)**
Numerical simulation of the steady viscous free-surface flow around the ship hull equipped with an active disc propulsion system in XCHAP.		7-8:**(4 hours)**
Numerical calculation of the stationary viscous flow of the flow around ship's hull without appendages, having real stern propulsion modeled by the lifting line theory in XCHAP.		9-10:**(4 hours)**
Numerical simulation of the steady viscous free-surface flow around the ship hull equipped with a propeller modeled by the lifting line theory in XCHAP.		11-12:**(4 hours)**
Numerical simulation of the steady viscous free-surface flow around the ship hull equipped with rudder and a propeller modeled by the lifting line theory in XCHAP.		13:**(2 hours)**
The completion of the project, delivery and presentation.		14:**(2 hours)**

Minimal reference list

1. Lungu, A., (Ed) “Numerical Modeling in Engineering”, Academica Press, Galati, 2001
2. Ferziger, J.H., Peric, M., ”Computational Methods for Fluid Dynamics”, Springer-Verlag, Third Edition, 2002
3. Flowtech International AB, “Shipflow 6.4 – User’s Manual”, Chalmers University of Technology Press, 2018

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme.

The subject goals are as follows:

- The adequate acquaintance and use of the partial differential equations that define the free-surface potential flow around a ship hull;
- Acquaintance and thorough understanding of the PDE’s that describes the boundary layer development around the ship hull;
- Skills regarding:
  - Worth motivation of the numerical solutions through the post-processing data techniques;
  - Technical solutions choices for reducing the ship resistance;
  - Hydrodynamic hull forms optimization;
- Proving a positive attitude towards the scientific achievement;
- Implication in the institutional development as well as in the scientific innovation;
- Engaging in partnerships with other similar scientific entities;

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	Written partial assessment	Written examination at which the student has to answer to nine theoretical questions and nine practical ones. Each one is marked by 0.5 points. A supplementary point is added only for those who participate to get the final mark	50%
	Written final assessment	Written examination at which the student has to answer to nine theoretical questions and nine practical ones. Each one is marked by 0.5 points. A supplementary point is added only for those who participate to get the final mark.	50%
10.5 Project	Final project defending	Oral examination based on the defending of the solutions chosen in the project	100%
10.6 Minimum performance standard			
– The student should have the project submitted at the due date and defended successfully; – Intermediate reports successfully taken; – The intermediate exam should be marked at least with 5; – The final exam should be graded at least with 5; – The final examination show is conditioned not only by the project delivery but also by a minimal grade of 5 for its defense. The final mark will be composed by 30%, of the score of the partial defend and 40% of the score of the final defend.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Integrated CAD-CAM tools in Naval Architecture 1**						
2.2 Lecture organizer							
2.3 Project organizer							
2.4 Year of study	**II**	2.5 Semester	I	2.6 Type of assessment	**E+P**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	3	where: 3.2 lecture	2	3.3 project	1
3.4 Total hours in the curriculum	42	where: 3.5 lecture	28	3.6 project	14

Time distribution	hours
Study after manuals, syllabuses, bibliography and notes	8
Further documentation in libraries, on specialized electronic platforms and fieldwork	2
Preparing seminars / labs, assignments, essays, portfolios and essays	0
Tutorials	4
Examinations	2
Other activities: project	6

3.7 Total hours of individual study	22
3.9 Total hours per semester	64
3. 10 Number of credits	2+2

4. Prerequisites (where relevant)

4.1 curriculum related	• Linear Algebra, Analytical and Differential Geometry, Technical and Infographic Drawing, Naval Theory. Computing techniques in shipbuilding.
4.2 competence related	• Adapt of general design concepts in naval architecture. • Define, analyze and use appropriate integrated design, calculation and analysis systems.

5. Conditions (where relevant)

5.1. of the lecture	• Classroom, laptop, videoprojector, whiteboard
5.2. of the project	• Numeric lab, videoprojector, computers, AVEVA Marine CAD / CAM software,.

6. Specific competences acquired

Professional competences	**C1 Preliminary design of ship's hydrodynamic forms – 4 credits**

Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C1.1 Specification and classification of methods for defining hydrodynamic forms of the vessel. C1.2 Explaining and interpreting the knowledge of hydrodynamics used in the preliminary design of ship shapes.
7.2 Specific aims	C1.3 Full use of the conceptual and methodological apparatus under incomplete information to solve hydrodynamic problems specific to the ship's preliminary design. C1.4 Application of criteria and assessment methods for preliminary design of shapes of the ship. C1.5 Model and project argumentation of the application of qualitative and quantitative methods specific to the preliminary design of hydrodynamic vessel shapes.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
Chapter 1. Theoretical fundamentals. Curved plane. Spatial curves. Cubic splines. Surfaces. Geometric and parametric continuity.	Lecture, heuristic conversation, explanation, questioning, debate, development of critical thinking	2 hours
Chapter 2. Bezier Curves and B-Spline. General. Definition of curbelor Bezier. The Bezier algorithm. Matrix representation of Bezier curves. B-Spline shape of the 3D curves. Properties of the B-Spline curves. Control of B-Spline curves.		2 hours
Head 3. Bezier and B-Spline surfaces. General. Definition of Bezier surfaces. Matrix representation of Bezier surfaces. Bicubic surfaces in B-Spline form. Other types of surfaces.		2 hours
Chapter 4. Geometrical modeling tools.		4 hours
Chapter 5. Non-relational geometric modellers.		4 hours
Chapter 6. Complex surface modeling in AVEVA Marine		14 hours

Bibliography

1. AVEVA Marine Surface & Compartment ,Aveva Co 2011
2. AVEVA Marine HULL, Aveva Co 2011
3. BV, „Rules for Classification and Construction", Bureau Veritas, 2018
4.DNV-GL., "Rules for Classification and Construction", Det Norske Veritas & Germanischer Lloyd, 2018
5.DNV-GL, "Poseidon User's Guide", Det Norske Veritas & Germanischer Lloyd,1999-2018
6. Popescu G. „Aveva Marine – Surface & compartment"- Note de curs 2009-2010
7. Dumitru Dragomir, Modelarea formelor în arhitectura navală, Editura Fundaţiei Universitare "Dunărea de Jos" Galaţi, 2006, ISBN 973-627-273-7, 149 pag., format electronic pe CD
5.DNV-GL, "Poseidon User's Guide", Det Norske Veritas & Germanischer Lloyd,1999-2018
6. Popescu G. „Aveva Marine – HULL"- Note de curs 2009-2010

8.2 Project	Teaching method	Observations Number of hours
1. Techniques for creating surface curves using unrelated modellers.	Case studies, numerical simulations, explanations, development of critical thinking	2 hours
2. Techniques for modeling the ship's theoretical surfaces (hull, appendix superstructure).		6 hours
3. Techniques for generating internal surfaces of the ship		3 hours
4. Definition of ship compartments, volumetry.		3 hours

Bibliography
1. AVEVA Marine Surface & Compartment ,Aveva Co 2011
2. AVEVA Marine HULL, Aveva Co 2011
3. BV, „Rules for Classification and Construction", Bureau Veritas, 2018
4.DNV-GL., "Rules for Classification and Construction", Det Norske Veritas & Germanischer Lloyd, 2018
5.DNV-GL, "Poseidon User's Guide", Det Norske Veritas & Germanischer Lloyd,1999-2018
6. Popescu G. „Aveva Marine – Surface & compartment"- Note de curs 2009-2010
7. Dumitru Dragomir, Modelarea formelor în arhitectura navală, Editura Fundaţiei Universitare "Dunărea de Jos" Galaţi, 2006, ISBN 973-627-273-7, 149 pag., format electronic pe CD

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The discipline has a strong formative character in the profile of the practitioner and researcher of the master student in the field of naval architecture. This specialty discipline consists of two parts: Semester 1: study of general methods of 3D modeling of ship shapes, and in Semester 2: knowledge of dedicated programs of integrated naval design.
-learning the special computation techniques about the 3D ship design structures ;
-learning the methods for working in/with a CAD-CAM system data base.
These competences are required by employers in the labour market, both in the country and abroad, involved in the research and design activities in naval architecture.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	- Understanding and assimilating specialized knowledge of the subject	A practical exam consisting of checking the skills of the design skills of a complex block with a high degree of complexity.	100%
10.5 Project	Application of specialized knowledge of the discipline in the design activity for static and dynamic structural analysis of the ship.	Project support: description of used procedures, analysis of modeling procedures, quality modeling verification criteria	100%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- The student must complete the project. - The final exam / colloquium passed on each evaluation state with grade 5.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Optimal Shipbuilding Technologies**						
2.2 Lecture organizer							
2.3 Laboratory organizer							
2.4 Year of study	**II**	2.5 Semester	**I**	2.6 Type of assessment	**E**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	4	where: 3.2 lecture	2	3.3 laboratory	2
3.4 Total hours in the curriculum	56	where: 3.5 lecture	28	3.6 laboratory	28
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					10
Further documentation in libraries, on specialized electronic platforms and fieldwork					4
Preparing laboratory, assignments, essays, portfolios and essays					4
Tutorials					2
Examinations					2
Other activities					0

3.7 Total hours of individual study	22
3.9 Total hours per semester	78
3. 10 Number of credits	4

4. Prior learning / Prerequisites (where relevant)

4.1 curriculum-related	– None
4.2 competence-related	– None

5. Conditions (where relevant)

5.1. of the lecture	– Classroom or Microsoft Teams online Platform, laptop, projector
5.2. of the laboratory	– Laptop, Microsoft Teams online Platform or projector

6. Specific competences acquired

Professional competences	**C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding – 4 credits**

Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C5.1 In-depth knowledge, analysis and synthesis of naval technologies. C5.2 Use of information sources and specialized knowledge for the analysis, evaluation and selection of technological solutions imposed in new situations.
7.2 Specific aims	C5.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C5.4 Applying algorithms to assess the performance of new technologies to improve decision making. C5.5 Innovative use of specific technologies for the purpose of project development.

8. Contents

8. 1 Lecture	Teaching method	Observations
1.The shipbuilding process – Shipbuilding Terms and Definitions – Status of the Shipbuilding Industry	PowerPoint slides	C1 (2 hours)
2.Shipbuilding management theory – Shipbuilding Economic Theory – Group Technology – Work Breakdown Structures	PowerPoint slides	C2 (2 hours)
3.Product-oriented work breakdown structure – Planning for Production – Zone Construction Method – Pipe Piece Family Manufacture	PowerPoint slides	C3 (2 hours)
4.Metal manufacturing and construction processes – Hull Materials – Metal Processes – Outfit Processes	PowerPoint slides	C4 (2 hours)
5.Welding – Welding and cutting processes used in shipbuilding – Welding practice and testing welds	PowerPoint slides	C5-C7 (6 hours)
6.Fracture Control – Jack-Knifed Failure of Liberty Ships – Fracture Mechanics – Fatigue Strength Design	PowerPoint slides	C8 (2 hours)
7.Assembly of ship structure – Plate and section preparation and machining – Frame bending – Block assembly – Outfit modules – Unit erection – Joining ship sections afloat	PowerPoint slides	C9-C10 (4 hours)
8.Shipyard layout – Historical Perspective – Shipyard Facilities and Sitting – Process Lanes	PowerPoint slides	C11 (2 hours)
9.Planning, scheduling, and production control	PowerPoint slides	C12

– Planning Overview – Planning and Scheduling – Production Control – Material Control		(2 hours)
10.Accuracy control – Planning – Executing – Evaluating – Applications	PowerPoint slides	C13 (2 hours)
11.Ship conversion, overhaul, and repair – Selecting an Approach – Repair and Overhaul – Conversion and Modernization – Deactivation – Scrapping – Recent Innovations in Ship Repair	PowerPoint slides	C14 (2 hours)
References 1. Dokkum, K.v., "Ship Knowledge, a modern encyclopedia", Dokmar, First Editon, 2003 2. Eyres, D.J., Bruce, G.J., "Ship Construction" Butterworth-Heinemann, Seventh edition, 2012 3. Okumoto, Y., Takeda, Y., Mano, M., Okada, T., "Design of Ship Hull Structures - A Practical Guide for Engineers", Springer-Verlag, 2009 4. Storch, R.L., Hammon, C.P., Bunch, H.M. & Moore, R.C., "Ship production", Cornell Maritime press, Inc, Second Edition, 1995 5. Taylor, D.A., "Merchant Ship Construction", The Institute of Marine Engineers, Third Edition, 1992		

8. 2 Laboratory	Teaching method	Observations
1.Power sources used for welding, operating mode, technical performance	Based on the use of the minimal reference list as well as on case studies presented (video and/or power-point slides descriptions)	L1:**(2 hours)**
2.Semiautomatic and automatic welding; machines and installations used, mode of operation; technical performance.		L2:**(2 hours)**
3.Welding in protective and active gas environments. MIG equipment; MAG; CARGON; operating mode, technical performance		L3:**(2 hours)**
4.Technological tools and equipment used to assemble prefabricated elements and the ship's body		L4:**(2 hours)**
5.Assembly and welding technology of flat sections, automatic technological lines for assembling flat sections.		L5:**(2 hours)**
6.Assembly and welding technologies for curved, volume and block sections.		L6:**(2 hours)**
7.Technologies for the assembly and welding of the ship's body on a mounting bay and in a dry dock.		L7:**(2 hours)**
8.Cutting of laminates, used cutting machines and technologies, technical performance and operation.		L8:**(2 hours)**
9.Sheet metal forming, machining and cutting technologies.		L9:**(2 hours)**
10.Profile processing; machines used for cutting and welding. Automatic processing lines for profiles.		L10:**(2 hours)**
11.Nondestructive evaluation : Liquid Penetrant		L11:**(2 hours)**
12.Nondestructive evaluation : Ultrasound		L12:**(2 hours)**
13.Nondestructive evaluation : Magnetic Particle		L13:**(2 hours)**
14. Nondestructive evaluation : Eddy Current		L14:**(2 hours)**
Minimal reference list 1. Babicz, J., "Wärtsilä Encyclopedia of Ship Technology", Wärtsilä Corporation, Second Edition, Helsinki, 2015		

2. Mandal, N.R., ” Ship Construction and Welding”, Springer Nature Singapore Pte Ltd., 2017
3. Schull, P.J., “Nondestructive Evaluation - Theory, Techniques, and Applications”, Marcel Dekker, Inc., New York, 2001

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The subject goals are as follows:
- Knowledge of modern methods of naval technological design, development of skills necessary to solve such problems, training of competencies in the coordination and control of ship manufacturing and assembly activities;
- Acquiring the knowledge necessary to develop the manufacturing, assembly and welding technologies, the measuring and control instruments used;
- Assimilation of the technological design knowledge necessary for the correct selection of the naval design solutions.
- Strengthen the skills related to the correct assessment of the technical solutions adopted and their optimal implementation in practice in technological terms;
- Involvement in the promotion of modern technical and technological solutions, their conception and practical application.
- Understand the importance of the link of the individual training related to the whole process of elaborating a technological project. Optimal and creative optimization of its own potential in scientific activities;
- Involvement in institutional development and promotion of scientific innovations;
- Engage in partnerships with other similar scientific entities.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	Final written evaluation	Exam on written descriptive examination, to which the student has the answer to nine theoretical questions and applications. Each question is marked with 1 point. On the total points obtained, add the point ex officio to give the final grade of the exam.	70%
10.5 Laboratory	Apply the fundamental knowledge of the discipline	Presentation of the laboratory themes	30%
10.6 Minimum performance standard			
– The student must have all the laboratory subjects taught. – The final exam passed with at least grade 5.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Offshore Units and Systems**						
2.2 Lecture organizer							
2.3 Project organizer							
2.4 Year of study	**II**	2.5 Semester	I	2.6 Type of assessment	**E+P**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	3	where: 3.2 lecture	2	3.3 project	1
3.4 Total hours in the curriculum	42	where: 3.5 lecture	28	3.6 project	14
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					10
Further documentation in libraries, on specialized electronic platforms and fieldwork					4
Preparing seminars / labs, assignments, essays, portfolios and essays					0
Tutorials					5
Examinations					5
Other activities. Project					10

3.7 Total hours of individual study	34
3.9 Total hours per semester	76
3. 10 Number of credits	3+3

4. Prior learning / Prerequisites (where relevant)

4.1 curriculum-related	• Strength Materials, Mechanics, Fluid Mechanics, Numerical Methods, Programming
4.2 competence-related	• Adapt general design concepts in naval architecture.

5. Conditions (where relevant)

5.1. of the lecture	• Classroom, laptop, videoprojector, whiteboard
5.2. of the project	• Computer network room, project guide

6. Specific competences acquired

Professional competences	**C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 6 credits**
Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions.
7.2 Specific aims	C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8. 1 Lecture	Teaching method	Observations
Chapter 1- Types of offshore units, characteristics, future development directions, applicable rules. Technological installations of offshore units (drilling, refining, liquefaction).	Lecture, heuristic conversation, explanation, questioning, debate, development of critical thinking	C1 – C4 (8 hours)
Chapter 2 – Types of loads to which offshore units are subjected, performance, technical criteria.		C5 – C6 (4 hours)
Chapter 3 – Determination of hydrodynamic forces acting on offshore units.		C7 – C8 (4 hours)
Chapter 4 - Determination of aerodynamic forces acting on offshore units.		C9 – C10 (4 hours)
Chapter 5 – Determination of forces in mooring lines of offshore units.		C11 – C12 (4 hours)
Chapter 6 – Analysis of the equations of motion for an offshore unit depending on the type of mooring system.		C13 – C14 (4 hours)

Bibliography

1. ABS, Offshore Systems Rules, Houston, 2023
2. Aage, C., Bernitsas, M. M., Choi, H.S., Crudu, L., Hirata, K., Incecik, A., Kinoshita, T., Moxnes S., Murray, J.J., *Report of the ITTC Specialist Committee on Deep Water Mooring*, 22nd International Towing Tank Conference (ITTC), pp. 375-398, 5-11 September, Seoul, Korea and Shanghai, China, 1999 and The Society of Naval Architects of Korea and The Chinese Society of Naval Architects and Marine Engineers, 1999.9
3. Barltrop N. D. P., Adams A.J., Dynamics ot Fixed Marine Structures, Third edition, MTD Limited , Butterworth – Heinemann, London, 1991.
4. Ben C. Gerwick Jr., Construction of marine and offshore structures, Second Edition, CRC Press, New York Washington D.C., 2000
5. Chakrabarti, S.K., Hydrodynamics of Offshore Structures, Computational Mechanics Publications, Southampton Boston, Springer-Verlag Berlin, 1987
6. Clauss G., Lehmann E., Őstergaard C., Offshore structures, Springer-Verlag London, Limited,1992.
7. Crudu, L., Aplicaţii teoretice şi experimentale în industria offshore, Editura Fundaţiei Universitare „Dunărea de Jos" – Galaţi, 2015

8. Faltinsen, O.M., Hydrodynamic Loads on Marine Structures, Theoretical and Applied Mechanics, IUTAM, Elsevier Science Publishers B.V., 1985
9. Hooft, J.P., Advanced Dynamics of Marine Structures, John Wiley & Sons, 1982
10. Kinoshita, T., Hirata, K., Colbourne, B., Pinkster, J.A., Jianmin, Y., Ha, M.K., Thiagarajan, K., Crudu, L., *Report of the ITTC Specialist Committee on Stationary Floating Systems*, 23rd International Towing Tank Conference (ITTC), Volume II, pp. 545-571, 8–14 September, Venice, Italy, 2002 and Marine Technology, Holland
11. Kokkinowrachos, K., Handbuch der Werften, Offshore - Bauwerke, Hydromechanik, Schiffahrts-Verlag, HANSA, C. Schroedter & Co., Hamburg 11, 1980
12. Paik J.K., Thayamballi A.K., „Ship Shaped Offshore Installations", Cambridge University Press, 2007
13. Paulling, J.R., Hydrodynamic Synthesis of Marine Structures, Theoretical and Applied Mechanics, IUTAM, Elsevier Science Publishers B.V., 1985
14. Sarpkaya, T., Isaacson, M., Mechanics of Waves Forces on Offshore Structures, van Nostrand Reinhold Company, New York, 1981
15. Visser W. The structural design of offshore jackets, MTD Limited, Publication 94/100, London, 1993.

8.2 Project	Teaching method	Observations
1. The study and adoption of the technological and constructive solution for the offshore unit imposed by the theme.	Case studies, numerical simulations, explanations, development of critical thinking	P1 (2 hours)
2. Establishing the main dimensions of the offshore unit. Setting up the offshore unit, choosing the mooring systems.		P2 (2 hours)
3. Determination of the hydrodynamic and aerodynamic forces acting on the offshore unit		P3-P4 (4 hours)
4. Structural design of the offshore unit in accordance with classification society regulations		P5-P7 (6 hours)

Bibliography

1. ABS, Offshore Systems Rules, Houston, 2023
2. Barltrop N. D. P., Adams A.J., Dynamics ot Fixed Marine Structures, Third edition, MTD Limited , Butterworth – Heinemann, London, 1991.
3. Bendat, J.S., Piersol, A.G., Engineering Applications of Correlation and Spectral Analysis, Wiley – Interscience Publication, New York – Chichester – Brisbane – Toronto, 1980
4. Ben C. Gerwick Jr., Construction of marine and offshore structures, Second Edition, CRC Press, New York Washington D.C., 2000
5. Bhattacharyya, R., Dynamics of Marine Vehicles, John Wiley & Sons Publishing House, New York, 1982
6. Clauss G., Lehmann E., Őstergaard C., Offshore structures, Springer-Verlag London, Limited,1992.
7. Crudu, L., Aplicaţii teoretice şi experimentale în industria offshore, Editura Fundaţiei Universitare „Dunărea de Jos" – Galaţi, 2015
8. Jourenee, J.M.J., Massie, W.W., Offshore Hydromechanics, First Edition, Delft University of Technology, January
9. Moxnes, S., Ultra Small Scale Model Testing of a FPSO Ship, Proceedings of the "Workshop on Deep Water Mooring and Related Topics in Offshore Engineering", ITTC Specialist Committee Meeting, Galaţi, Romania, October 1998
10. Nakajima, S., Motora, S., Fujimo, M., On the Dynamic Analysis of Multi-Component Mooring Lines, 14th OTC, paper no. 4309, Houston, Texas, May 1982
11. Pinkster, J.A., Remery, G.F.M., The Role of Model Tests in the Design of Single Point Mooring Terminals, 7th OTC, paper no.2212, Houston, Texas, 1975
12. Paik J.K., Thayamballi A.K., „Ship Shaped Offshore Installations", Cambridge University Press, 2007
13. Pinkster, J.A., Low Frequency Second Order Wave Exciting Forces on Floating Structures, Publication No.650, NSMB, 1980
14. Takagi, M., Arai, S.I., Takezava, S., Tanaka, K., Takarada, N., A Comparison of Methods for Calculating the Motion of a Semisubmersible, Ocean Engineering, vol. 12, no. 1, pp. 45-97, 1985
15. van Oortmerssen, G., The Motions of a Moored Ship in Waves, NSMB, Publication No.510, Wageningen, 1976
16. Visser W. The structural design of offshore jackets, MTD Limited, Publication 94/100, London, 1993.

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

Through its content, the discipline aims to provide the naval engineer with in-depth knowledge on understanding the specific issues that arise in the design, construction and operation of offshore structures. It is essential to understand and make use of the conceivable differences in ship design with regard to the existence of concepts of operational and survival limit, as well as the impact on the environment and staff. It is also important to understand the need to adapt to the specific conditions of the location. The main objective is to create intellectual, analytical, synthesis and comparison capabilities so that they can make the right decisions in a new issue that would arise in ocean engineering.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	-Understanding and assimilating specialized knowledge of the subject -Developing the necessary rationale for designing and research for marine structures	The final exam	75%
		Presence at the course, participation in debates, stimulation of critical thinking.	25%
10.5 Project	Application of specialized knowledge of the discipline in the design of marine structures	The evaluation of the project, which quantifies the rhythmic involvement and the correctness of the obtained numerical results, as well as the final support of the project content.	100%
10.6 Minimum performance standard			
- The student must complete the project. - The Final Examination / Final Verification will be promoted for each stage with grade 5.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Research & Design Internship 3**						
2.2 Lecture organizer							
2.3 Internship organizer							
2.4 Year of study	**II**	2.5 Semester	I	2.6 Type of assessment	**V**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	14	where: 3.2 lecture	-	3.3 internship	14
3.4 Total hours in the curriculum	196	where: 3.5 lecture	-	3.6 internship	196
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					14
Further documentation in libraries, on specialized electronic platforms and fieldwork					14
Preparing assignments, portfolios					14
Tutorials					10
Examinations					4
Other activities:					-

3.7 Total hours of individual study	56
3.9 Total hours per semester	252
3. 10 Number of credits	10

4. Prerequisites (where relevant)

4.1 curriculum related	• Disciplines from the bachelor's degree in Naval Architecture / Mechanical Engineering. • Full assisted disciplines from the Naval Architecture Master.
4.2 competence related	• Define, analyze, and use appropriate research and design systems.

5. Conditions (where relevant)

5.1. of the lecture	• -
5.2. of the internship	• Experimental and numerical laboratories within the Research Center "Naval Architecture", experimental equipment, computers, software, Internet access, bibliographic sources. • Research and design laboratories at partner internship companies.

6. Specific competences acquired

Professional competences	**C1 Preliminary design of ship's hydrodynamic forms – 2 credits** **C2 Hydrodynamic optimization of the hull forms – 2 credits** **C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding. – 1 credit** **C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 2 credits**
Transversal competences	**CT1 Fulfilment in due time of the design and/or the research activities in naval architecture – 1 credit** **CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture – 1 credit** **CT3 Assessment of the need for professional training, in the context of the evolution of the field – 1 credit**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C1.1 Specification and classification of methods for defining hydrodynamic forms of the vessel. C1.2 Explaining and interpreting the knowledge of hydrodynamics used in the preliminary design of ship shapes. C2.1 Detailing the methods, techniques and procedures for describing the concepts related to the hull forms optimization. C2.2 Explaining and sensing the applied hydrodynamics knowledge to the particular problem of a ship hull regardless of its geometry. C5.1 In-depth knowledge, analysis and synthesis of naval technologies. C5.2 Use of information sources and specialized knowledge for the analysis, evaluation and selection of technological solutions imposed in new situations. C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions. CT1 Fulfilment in due time of the design and/or the research activities in naval architecture CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture CT3 Assessment of the need for professional training, in the context of the evolution of the field
7.2 Specific aims	C1.3 Full use of the conceptual and methodological apparatus under incomplete information to solve hydrodynamic problems specific to the ship's preliminary design. C1.4 Application of criteria and assessment methods for preliminary design of shapes of the ship. C1.5 Model and project argumentation of the application of qualitative and quantitative methods specific to the preliminary design of hydrodynamic vessel shapes. C2.3 Complete use of the conceptual and methodologic apparatus to solve specific hydrodynamics problems related to the optimal design of the hull forms. C2.4 Applying criteria and evaluation methods with which the hull forms can be improved. C2.5 Argumentation by models and projects of the most appropriate methods for defining the optimal forms from a hydrodynamic point of view. C5.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C5.4 Applying algorithms to assess the performance of new technologies to improve decision making. C5.5 Innovative use of specific technologies for the purpose of project development. C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
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8.2 Internship	Teaching method	Observations Number of hours
1. Theoretical modeling of the research topic	Research and design	196 hours
2. Development of the theoretical model. Theoretical results		
3. Numerical modeling of the research topic theme.		
4. Development the numerical model. Numerical results		
5. Technological modeling of the research topic theme.		
6. Development the technological model. Technological results		
7. Translating results from model to nature		
8. Experimental modeling of the research topic theme		
9. Development of the experimental model. Results by experimental model		
10. Translating experimental results from model to nature		
11. Research-design internship report		

Bibliography

1. Amoraritei, M., ”Complements of Marine Propellers Hydrodynamics in Non-uniform Flow”, Galati Univ. Press, 2008
2. Andersson, B., Andersson, R., Hakansson, L., Mortensen, M., Sudiyo, R., van Wachem, B., ”Computational Fluid Dynamics for Engineers”, Cambridge University Press, 2012
3. Betram, V., “Practical Ship Hydrodynamics”, (Ed.II) Butterworth Heinemann, Oxford, 2012
4. Babicz, J., “Wärtsilä Encyclopedia of Ship Technology“, Wärtsilä Corporation, Second Edition, Helsinki, 2015
5. Breslin, J.,P., ”Hydrodynamics of Ship Propeller”, Cambridge University Press, 2003
6. BV, „Rules for Classification and Construction”, Bureau Veritas, 2023
7. Carlton, J., S., ”Marine Propellers and Propulsion”, Elsevier, 2006
8. Domnisoru, L., “Structural Analysis and Hydroelasticity of Ships”, The „Dunărea de Jos” University Foundation Publishing House, Galati, 2006
9. Domnisoru, L., Lungu, A., Dragomir, D., Ioan, A., „Complements of Structural Analysis and Ship Hydrodynamics”, Galati University Press, 2008
10. DNV-GL., “Rules for Classification and Construction”, Det Norske Veritas & Germanischer Lloyd, 2023
11. Dragomir, D., Lungu, A., Domnisoru, L., „Naval Architecture Design Complements”, „Didactic and Pedagogic” Publising House, Bucharest, 2007
12. Eyres, D.J., „Ship Construction”, Elsevier Butterworth-Heinemann, New York, 2007
13. Ferziger, J.H., Peric, M., ”Computational Methods for Fluid Dynamics”, Springer-Verlag, Third Edition, 2002
14. Ghose, J., P., Gokarn, R., P., ”Basic Ship Propulsion”, New Delhi, 2004
15. Hadar, A., „Multilayer Composite Materials”, Academy and AGIR Publishing House, Bucharest, 2002
16. Hadar,A., Marin,C., Petre,C., Voicu,A., " Numerical Methods in Engineering ", Politehnica Press, Bucharest, 2005
17. Hirsch, C., ” Numerical Computation of Internal and External Flows: The Fundamentals of Computational Fluid Dynamics”, Butterworth-Heinemann, 2007
18. ISO 6954:2000, "Mechanical vibration — Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/obp/ui/#iso:std:iso:6954:ed-2:v1:en
19. ISO 20283-5:2016, "Mechanical vibration — Measurement of vibration on ships — Part 5: Guidelines for measurement, evaluation and reporting of vibration with regard to habitability on passenger and merchant ships", https://www.iso.org/ obp/ui/#iso:std:iso:20283:-5:ed-1:v1:en
20. Lewandowski, E.M., „The Dynamics of Marine Craft”, World Scientific, New Jersey, 2004
21. LR, “Ship Vibration and Noise. Guidance Notes”, Lloyd's Register, London, 2023
22. Lungu, A., (Ed) “Numerical Modeling in Engineering”, Academica Press, Galati, 2001
23. Mandal, N.R., ” Ship Construction and Welding”, Springer Nature Singapore Pte Ltd., 2017
24. Mansour, A., Liu, D., „Strength of Ships and Ocean Structures, The Principles of Naval Architecture Series, SNAME, New Jersey, 2008
25. Mocanu, C., "Strength of Materials", „Dunărea de Jos” University Foundation Publishing House, Galati, 2005
26. Obreja, D., “ Ship theory. Concepts and Methods of Navigation Performance Analysis”, „Didactic and Pedagogic” Publishing House, Bucharest, 2005

27. Okumoto, Y., Takeda, Y., Mano, M., Okada, T., “Design of Ship Hull Structures - A Practical Guide for Engineers”, Springer-Verlag, 2009
28. Paik, J.K., Thayamballi, A.K., „Ship Shaped Offshore Installations”, Cambridge University Press, 2007
29. Rao, S.S., “The Finite Element Method in Engineering”, Elsevier Science & Technology Books,, New York, 2004
30. Rawson, K.J., Tupper E.C., „Basic Ship Theory”, (2 vol) Butterworth Heinemann, Oxford, 2001
31. Rodolfo, A., White, J., “Dynamic Scheduling with Microsoft Project”, International Institute for Learning, 2011
32. Serban, D., Gavan, E., “Shipbuilding and Welding Technology”, Evrika Publishing House, Brăila, 2001
33. Spyridon, E.H., Chunhua, Ge, “Review & Introduction to Hydroelasticity of Ships”, Lloyd’s Register, London , 2005
34. Stoicescu, L., "Strength of Materials", Evrika Publishing House, Braila, 2 vol., 2004
35. Storch, R.L., Hammon, C.P., Bunch, H.M. & Moore, R.C., “Ship production”, Cornell Maritime Press, 2000
36. Schull, P.J., “Nondestructive Evaluation - Theory, Techniques, and Applications”, Marcel Dekker, New York, 2001
37. Versteeg, H., Malalasekera, W., ”An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, Prentice Hall, 2007
38. Vlase, S. , „Composite Materials. Numerical Methods , “Transilvania” University Publishing House, Brașov, 2007
39. Vorus, W.S., „Vibration”, The Principles of Naval Architectures Series, SNAME, New Jersey, 2010
40. Zienkiewicz, O.C., Taylor, R.L.,”The Finite Element Method” (3 Vol.), Elsevier Butterworth-Heinemann, Oxford, 2000

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The training includes the basic elements for integrating the graduate in the activities of the shipbuilding research and design companies, as well as for Bologna III PhD studies.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	---	---	---
10.5 Internship	Applying specialized knowledge in research and design activities	- Evaluating the weekly research-design internship that quantifies the rhythmic involvement and accuracy of the results. - Evaluation of the research-design internship report.	70% 30%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- The student should pass the current activities in the research and design internship. - The student should pass with the grade 5 the examination of the research-design internship report.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Integrated CAD-CAM tools in Naval Architecture 2**						
2.2 Lecture organizer							
2.3 Project organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**E+P**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	4	where: 3.2 lecture	2	3.3 project	2
3.4 Total hours in the curriculum	56	where: 3.5 lecture	28	3.6 project	28
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					8
Further documentation in libraries, on specialized electronic platforms and fieldwork					2
Preparing seminars / labs, assignments, essays, portfolios and essays					0
Tutorials					2
Examinations					2
Other activities: project					6

3.7 Total hours of individual study	20
3.9 Total hours per semester	76
3. 10 Number of credits	2+2

4. Prerequisites (where relevant)

4.1 curriculum related	• Ship Construction, Technical Design and Infographic, Ship Theory, Computing technics in ship construction.
4.2 competence related	• Adapt of general design concepts in naval architecture. • Define, analyze and use appropriate integrated design, calculation and analysis systems.

5. Conditions (where relevant)

5.1. of the lecture	• Classroom, laptop, videoprojector, whiteboard
5.2. of the project	• Numeric lab, videoprojector, computers, AVEVA Marine CAD / CAM software,.

6. Specific competences acquired

Professional competences	**C4 Advanced design of ship structures – 4 credits**

Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C4.1 Defining and specifying methods, techniques and procedures for describing concepts specific to the advanced design of ship structures. C4.2 Classification and use of methods, techniques and procedures for analyzing concepts specific to advanced design of new ship structures.
7.2 Specific aims	C4.3 Apply the appropriate methods and techniques for the advanced design of ship structures under incomplete information to solve new theoretical problems. C4.4 Evaluate and interpret data specific to the advanced design of ship structures to substantiate constructive decisions. C4.5 Making models and designing projects that use innovative qualitative and quantitative methods specific to the advanced ship structures design. Developing projects using concepts specific to the advanced design of ship structures.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
1. Complex blocks modeling.	Lecture, heuristic conversation, explanation, questioning, debate, development of critical thinking	2 hours
2 Coordinate systems		2 hours
3 Locate blocks sections and panels.		2 hours
4 Creating an atypical views. Define grid.		2 hours
5 Generate comprehensive panel. Define Limits.		2 hours
6 Seams modeling. Plates modeling.		2 hours
7 Stiffners modelling .		2 hours
8 Edit and modify DB schemes.		2 hours
9 Cuttings modeling. Notch modeling		2 hours
10 Complex brackets modeling .		2 hours
11 Complex flanges modeling .		2 hours
12 Handling panels		2 hours
13 Assembly drawings generation		2 hours
14. Construction drawings generation		2 hours

Bibliography

1. AVEVA Marine Planar HULL ,Aveva Co 2011
2. AVEVA Marine HULL, Aveva Co 2011
3. BV, „Rules for Classification and Construction", Bureau Veritas, 2018
4.DNV-GL., "Rules for Classification and Construction", Det Norske Veritas & Germanischer Lloyd, 2018
5.DNV-GL, "Poseidon User's Guide", Det Norske Veritas & Germanischer Lloyd,1999-2018
6. Popescu G. „Aveva Marine – HULL"- Note de curs 2009-2010

8.2 Project	Teaching method	Observations Number of hours
Step1. Identify the technical specifications of the design theme (block , sections and panels). Grid define. Comprehensive pannel generation. Limits.	Case studies, numerical simulations, explanations, development of critical thinking	4 hours
Step 2. Seams modeling. Plates modeling. Stiffners modelling (for complex 3D models)		4 hours
Step 3 DB schemes editing. Cuttings modeling. Notch modeling		4 hours
Step 4 Complex brackets modeling. Complex flanges modeling .		4 hours

Step 5. Curved panels modelling.		4 hours
Step 6. Assembly drawings generation		4 hours
Step 7. Construction drawings generation. Production Interface.		4 hours

Bibliography
1. AVEVA Marine Planar HULL ,Aveva Co 2011
2. AVEVA Marine HULL, Aveva Co 2011
3. BV, „Rules for Classification and Construction", Bureau Veritas, 2018
4.DNV-GL., "Rules for Classification and Construction", Det Norske Veritas & Germanischer Lloyd, 2018
5.DNV-GL, "Poseidon User's Guide", Det Norske Veritas & Germanischer Lloyd,1999-2018
6. Popescu G. „Aveva Marine – HULL"- Note de curs 2009-2010

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The discipline has a strong formative character in the profile of the practitioner and researcher of the master student in the field of naval architecture. This specialty discipline consists of two parts: Semester 1: study of general methods of 3D modeling of ship shapes, and in Semester 2: knowledge of dedicated programs of integrated naval design.
-learning the special computation techniques about the 3D ship design structures ;
-learning the methods for working in/with a CAD-CAM system data base.
These competences are required by employers in the labour market, both in the country and abroad, involved in the research and design activities in naval architecture.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	- Understanding and assimilating specialized knowledge of the subject	A practical exam consisting of checking the skills of the design skills of a complex block with a high degree of complexity.	100%
10.5 Project	Application of specialized knowledge of the discipline in the design activity for static and dynamic structural analysis of the ship.	Applying the fundamental knowledge and information of the discipline through its own effort of conception, concretized in a design of complex structural sections.	100%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
- The student must complete the project. - The final exam / colloquium passed on each evaluation state with grade 5.			

SUBJECT OUTLINE

1. Date despre program

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Commissioning**						
2.2 Lecture organizer							
2.3 Laboratory organizer							
2.4 Year of study	**II**	2.5 Semester	**II**	2.6 Type of assessment	**E**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	4	where: 3.2 lecture	2	3.3 laboratory	2
3.4 Total hours in the curriculum	56	where: 3.5 lecture	28	3.6 laboratory	28
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					10
Further documentation in libraries, on specialized electronic platforms and fieldwork					4
Preparing laboratory, assignments, essays, portfolios and essays					7
Tutorials					4
Examinations					2
Other activities					0

3.7 Total hours of individual study	27
3.9 Total hours per semester	83
3. 10 Number of credits	5

4. Prior learning / Prerequisites (where relevant)

4.1 curriculum-related	• None
4.2 competence-related	• None

5. Conditions (where relevant)

5.1. of the lecture	• The right of sustaining the final examination is conditioned by participating to the Laboratories.
5.2. of the laboratory	• The student attendance of all scheduled Laboratories is compulsory.

6. Specific competences acquired

Professional competences	**C5 In-depth knowledge and development of materials and technologies used in the field of shipbuilding – 3 credits** **C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 2 credits**
Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C5.1 In-depth knowledge, analysis and synthesis of naval technologies. C5.2 Use of information sources and specialized knowledge for the analysis, evaluation and selection of technological solutions imposed in new situations. C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions.
7.2 Specific aims	C5.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C5.4 Applying algorithms to assess the performance of new technologies to improve decision making. C5.5 Innovative use of specific technologies for the purpose of project development. C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8. 1 Lecture	Teaching method	Observations
1.General considerations	PowerPoint slides displayed on the intelligent board	2 hours
2.Preparing the commissioning program		4 hours
3.Planning and coordination of the commissioning program		4 hours
4.Starting-up tehcnoligy of the ship sytems		4 hours
5.Organizing the commissioning program		6 hours
6.Specific materials requetsed by the commissioning program		4 hours
7. Harbour tests and sea trials requested by the commissioning program		4 hours

References

1. Ceangă, V., Lungu, A., Paraschivescu, C., Ploeșteanu C., 2000, *"Deck Machinary"* Academica Publishing House, ISBN 973-98858-8-8
2. Lungu, A., 1999, *"Hydropneumatic Naval Machinery and Drives"*, Tehnical Publishing House, Bucharest, ISBN 973-31-1330-1
3. Ceangă, V., Paraschivescu, C., Lungu, A., Bidoae, R., 1993, *"Pipes Systems"*, Galați University
4. Ceangă, V., Mocanu, C.I., Teodorescu, 2003, *"Dynamics of Propulsion Systems"*, Didactic and Pedagogic Publishing House, ISBN 973-30-2310-8, Bucharest

8. 2 Laboratory	Teaching method	Observations
1.Preparing the main engine for commissioning	Participation in the commissioning activities taking place in Damen Shipyards Galati	8 hours
2.Preparing the transfer fuel system for commissiong		4 hours
3.Starting-up the transfer fuel system		4 hours
4.Starting-up the M.E. cooling water system		4 hours
5.Harbour tests of the life saving system		4 hours
6.Harbour tests of the towing winch		4 hours

References

1. Ceangă, V., Lungu, A., Paraschivescu, C., Ploeșteanu C., 2000, *"Deck Machinary"* Academica Publishing House, ISBN 973-98858-8-8
2. Lungu, A., 1999, *"Hydropneumatic Naval Machinery and Drives"*, Tehnical Publishing House, Bucharest, ISBN 973-31-1330-1
3. Ceangă, V., Paraschivescu, C., Lungu, A., Bidoae, R., 1993, *"Pipes Systems"*, Galați University
4. Ceangă, V., Mocanu, C.I., Teodorescu, 2003, *"Dynamics of Propulsion Systems"*, Didactic and Pedagogic Publishing House, ISBN 973-30-2310-8, Bucharest

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

- The content of the discipline leads to acquiring the necessary competencies for coordinating the commissioning program of the ship;
- These knowledge are required by employers on the labor market and by shipyards, to the naval architects who want to become *„commissioning coordinators"* in a shipyard.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	Written assessment	Written exam. The student has to answer to 40 questions. Each answer is marked with 0.225 points. The final mark is the sum of the points obtained, plus a suplimentary point.	80%
10.5 Laboratory	Practical aplications	Reports of technological analysis of the performed commissioning tests, for improving the quality, reducing the duration of commissioning and the related costs.	20%

10.6 Minimum performance standard

- Presentation at the written exam is conditioned by attendance at Laboratories;
- The written exam should be graded at least with 5.

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galați
1.2 Faculty	Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master of Engineering
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Ethics and Academic Integrity**						
2.2 Lecture organizer							
2.3 Seminar organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**V**	2.7 Type of subject	**Compulsory**

3. Timpul total estimat (ore pe semestru al activităţilor didactice)

3.1 Total hours per week	2	where: 3.2 lecture	1	3.3 seminar	1
3.4 Total hours in the curriculum	28	where: 3.5 lecture	14	3.6 seminar	14
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					6
Further documentation in libraries, on specialized electronic platforms and fieldwork					1
Preparing seminars, assignments, portfolios					6
Tutorials					2
Examinations					2
Other activities:					-

3.7 Total hours of individual study	17
3.9 Total hours per semester	45
3. 10 Number of credits	3

4. Prerequisites (where relevant)

4.1 curriculum related	• Not the case
4.2 competence related	• Not the case

5. Conditions (where relevant)

5.1. of the lecture	• Classroom, laptop, videoprojector, whiteboard
5.2. of the seminar	• Classroom, laptop, videoprojector, whiteboard

6. Specific competences acquired

Professional competences	**Not the case**
Transversal competences	**CT1 Fulfilment in due time of the design and/or the research activities in naval architecture – 1 credit** **CT2 Efficient conduct of co-ordination of the design and/or the research activities in naval architecture – 1 credit** **CT3 Assessment of the need for professional training, in the context of the evolution of the field – 1 credit** **Competence to limit, identify and resolve potentially conflicting situations with ethical implications;** **Competencies to develop and implement codes of ethics and professional conduct.**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	-Learning appropriately the ethical and academic integrity-specific concepts for their application in the development of a responsible professional career, with moral conduct being an important reference of professionalism; - Developing the ability to comprehend, use, and compare / contrast English-language editing techniques according to the intended product text.
7.2 Specific aims	- Developing the capabilities of knowledge, appreciation and valorisation of the main points of view on academic ethics; - Developing the skills to identify and solve problems with ethical implications (ethical dilemmas); -Acquiring the knowledge and skills necessary to understand, respect, develop, implement codes of ethics and professional integrity.

8. Contents

8.1 Lecture	Teaching method	Observations Number of hours
1. Presentation of topics, objectives, methods; Introduction. What is ethics? What is Academic Ethics. What is scientific integrity? What is the ethics of research? Interdisciplinary and integrative approaches.	Lecture, explanation, problem, debate, critical thinking development	C1 (2 hours)
2. Standards of integrity in the field of teaching and research activity in higher education - Codes of ethics: errors and sanctions		C2 (2 hours)
3. When academic ethics is broken. Causes. Examples of unethical academic behavior: ethical practices and dilemmas, vulnerability and risk in school, university, public institutions.		C3 (2 hours)
4. Ethical issues in academic research. What is Plagiarism? Why do students complain? How should the phenomenon of plagiarism be addressed? How to search with integrity?		C4 (2 hours)
5. Academic research. Data collection. Publishing and copyright.		C5 (2 hours)
6. Academic research. Citation methods. APA and MLA. Avoiding plagiarism.		C6 (2 hours)
7. Intellectual property. Definition. Who Owns Intellectual Property? How to avoid the violation of intellectual property rights. Using of an sofware sistem to detect plagiarism.		C7 (2 hours)

Bibliography

1. Nituca, C., Etics and Integrity (in romanian),(http://www.euedia.tuiasi.ro/wp-content/uploads/Documente_PDF_Staff/Costica_Nituca/EI_Curs_Nituca.pdf)
2. Proctor, M., "Deterring Plagiarism: Some Strategies", University of Toronto, 2006, available at http://www.utoronto.ca/writing/plagiarism.html
3. Sarpe, D., Popescu D., Neagu A., Ciucur, V. – Integrity Standards of Higher University (in Romanian), online

edition, UEFISCDI, Bucharest, 2011 (http://old.uefiscdi.ro/Upload/27963931-6eb6-4a07-9e75-078a20de12b9.pdf)
4. Swartzlander, S. D.; Pace, D. & Stamler, V. L., "The ethics of requiring students to write about their personal lives." Chronicle of Higher Education, (February 17, 1993, B1-2).
5. Swayze, J.P.; Louis, K. S. & Anderson, M. S., "The ethical training of graduate students requires serious and continuing attention." Chronicle of Higher Education, (March 9, 1994, B1-4).
6. Sylvan Lake Associates.. „Ethical issues in research and science" (A computer-aided, self-instructional course), 1994
7. Taylor, B., "Letter To My Students", based upon ideas contained in the first draft of "The Fundamental Values of Academic Integrity," a document that was developed by, and is available from, the Center for Academic Integrity, 1999, (http://www.academicintegrity.org)
8. CE, The Code of Ethics of the Lower Danube University in Galati, 2017

8.2 Seminar	Teaching method	Observations Number of hours
1. Brief History of Academic Ethics.	Watching documentary. Debate.	S1 (2 hours)
2. Code of ethics- Dunarea de Jos University	Debate.	S2 (2 hours)
3. Violation of academic ethics. Vulnerability and risk in school, university, public institutions.	Debate.	S3 (2 hours)
4. Academic integrity. Copying the exams. Who, how, why is he copying?	Debate.	S4 (2 hours)
5. Academic research. Citation methods. APA Avoiding plagiarism.	Watching documentary. Debate. Exercise	S5 (2 hours)
6. Academic research. Citation methods. MLA. Avoiding plagiarism.	Watching documentary. Debate. Exercise	S6 (2 hours)
7. Intellectual property. Application of SISTEMANTIPLAGIAT.RO software system	Debate Exercise	S7 (2 hours)

Bibliography

1. Nituca, C., Etics and Integrity (in romanian),(http://www.euedia.tuiasi.ro/wp-content/uploads/Documente_PDF_Staff/Costica_Nituca/EI_Curs_Nituca.pdf)
2. Proctor, M., "Deterring Plagiarism: Some Strategies", University of Toronto, 2006, available at http://www.utoronto.ca/writing/plagiarism.html
3. Sarpe, D., Popescu D., Neagu A., Ciucur, V. – Integrity Standards of Higher University (in Romanian), online edition, UEFISCDI, Bucharest, 2011 (http://old.uefiscdi.ro/Upload/27963931-6eb6-4a07-9e75-078a20de12b9.pdf)
4. Swartzlander, S. D.; Pace, D. & Stamler, V. L., "The ethics of requiring students to write about their personal lives." Chronicle of Higher Education, (February 17, 1993, B1-2).
5. Swayze, J.P.; Louis, K. S. & Anderson, M. S., "The ethical training of graduate students requires serious and continuing attention." Chronicle of Higher Education, (March 9, 1994, B1-4).
6. Sylvan Lake Associates.. „Ethical issues in research and science" (A computer-aided, self-instructional course), 1994
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8. CE, Codul de etică al Universității Dunărea de Jos din Galați, 2017CE, The Code of Ethics of the Lower Danube University in Galati, 2017

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme

The content of the discipline responds to the thematic areas in the field approached at national and international level at this level of study, being prerequisites for the development of students' transversal competences. The correctness and accuracy of using the concepts and theories perceived in the discipline of ethics and academic integrity ensures a proper conduct of the students according to the ethics of the university.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	- identifying and understanding the notions and concepts taught at the course.	-active participation in the course through relevant interventions	10%
10.5 Seminar	- solving a work task - argumentative exercise; debate	-adequacy and quality of resources used	10%
		- the originality of the advanced thesis and / or of the argumentative approach - the level of critical thinking assimilation and the capacity to integrate it into the debate of ideas - presentation of documentation from own dissertation thesis using SISTEMANTIPLAGIAT.RO	30% 50%
10.6 Minimum performance standard (Each evaluation part is marked in the standard reference system 1-10.)			
-training and seminar participation (maximum 3 absences) -training a seminar theme -rediting a argumentative essay with minimal personal involvement -the acquisition of basic knowledge on the theoretical framework and the ability to identify, in general terms, the essential elements for the interpretation of a case study.			

SUBJECT OUTLINE

1. Academic programme details

1.1 Higher Education Institution	„Dunărea de Jos" University of Galaţi
1.2 Faculty	Naval Architecture / Naval Architecture
1.3 Department	Naval Architecture
1.4 Study area / Field	Naval Architecture
1.5 Programme degree	Master
1.6 Study programme / Qualification	Naval Architecture / Naval Architecture

2. Subject details

2.1 Subject title	**Marine Environmental Protection Technology**						
2.2 Lecture organizer							
2.3 Seminar / Recitation organizer							
2.4 Year of study	**II**	2.5 Semester	II	2.6 Type of assessment	**E + P**	2.7 Type of subject	**Compulsory**

3. Total average time (hours of teaching activities per semester)

3.1 Total hours per week	4	where: 3.2 lecture	2	3.3 project	2
3.4 Total hours in the curriculum	56	where: 3.5 lecture	28	3.6 project	28
Time distribution					hours
Study after manuals, syllabuses, bibliography and notes					10
Further documentation in libraries, on specialized electronic platforms and fieldwork					5
Preparing projects, assignments, essays, portfolios and essays					5
Tutorials					4
Examinations					2
Other activities					0

3.7 Total hours of individual study	26
3.9 Total hours per semester	82
3. 10 Number of credits	3+2

4. Prior learning / Prerequisites (where relevant)

4.1 curriculum-related	• Mechanic, Fluid Mechanic, Chemistry, Physical, Electronic, Design and info-graphics
4.2 competence-related	• Adaptation at the general concepts in naval architecture; • Defining, analysis and general using of the integrated systems regarding design, calculus and analysis having as target point avoiding the environment pollution and onboard ships

5. Conditions (where relevant)

5.1. of the lecture	• Room or online Microsoft Teams platform, laptop, video projector
5.2. of the project	• Analyzers for water, GPS, chronometer, noise measuring instruments, calibrators, computers, internet access, references, project guide (electronic forms)

6. Specific competences acquired

Professional competences	**C6 In-depth knowledge and development of materials and technologies used in offshore engineering – 5 credits**
Transversal competences	**Not applicable**

7. Learning outcomes (as resulting from the grid of specific competences acquired)

7.1 General aim of the subject	C6.1 In-depth knowledge, analysis and synthesis of the types of systems used in offshore engineering and specific technologies. C6.2 Analysis and evaluation of new offshore unit and offshore projects in order to identify optimal technological solutions.
7.2 Specific aims	C6.3 Integrated use of the information, conceptual and methodological apparatus in the development of innovative technologies. C6.4 Applying algorithms to evaluate the performances of innovative technologies in order to improve decision making. C6.5 Innovative use of specific technologies for designing projects.

8. Contents

8.1 Lecture	Teaching method	Observations hours
GREEN SHIP CONCEPT (PART 1) MARPOL Annex I: Oil pollution prevention MARPOL Annex II: Pollution categorization, Ship types, Operational requirements MARPOL Annex III: Prevention of pollution by harmful substances carried by sea in packaged form MARPOL Annex IV: Sewage pollution prevention MARPOL Annex V: Garbage pollution prevention	PowerPoint slides	C1 (2 hours)
GREEN SHIP CONCEPT (PART 2) MARPOL Annex VI: Prevention of air pollution from ships	PowerPoint slides	C2 (2 hours)
SHIP ENERGY EFFICIENCY (PART 1) IMO regulatory framework for ship energy efficiency. Chapter 4 of MARPOL Annex VI regulations Guidelines for calculation of Attained EEDI Guidelines for verification of Attained EEDI Guidelines for development of SEEMP Guidelines for calculation of EEOI	PowerPoint slides	C3 (2 hours)
SHIP ENERGY EFFICIENCY (PART 2) Guidelines on EEDI Calculation and Verification Guidelines on SEEMP and EEOI	PowerPoint slides	C4 (2 hours)
SHIP ENERGY EFFICIENCY (PART 3) Guidelines on SEEMP and EEOI	PowerPoint slides	C5 (2 hours)
Energy and Environmentally Efficient Ship Design (Part 1) Energy efficiency −Energy balance components Fuels, machinery etc. -Modelling ship energy efficiency -Methods for energy saving during various phases of ship design	PowerPoint slides	C6 (2 hours)
Energy and Environmentally Efficient Ship Design (Part 2) Energy saving methods and energy efficient design principles −Largest consuming groups: propulsion etc. −HVAC −Heat process efficiency and waste heat recovery Environmental legislation overview and examples Future proof ship design principle	PowerPoint slides	C7 (2 hours)
GREEN SHIP CONCEPT- 8500 TEU Container ship concept study (Part 1) 0.0 Introduction 1.0 General 2.0 Description of the A Class container ship. 3.0 General arrangement 4.0 Machinery arrangement 5.0 Basic ship data	PowerPoint slides	C8 (2 hours)
GREEN SHIP CONCEPT- 8500 TEU Container ship concept study (Part 2) 6.0 Developed energy saving and exhaust gas cleaning technologies. 6.1 Change of main engine incl. EGR and WIF 6.2 Waste Heat Recovery Systems 6.3 Scrubber system 6.4 Turbo generator system 6.5 Space considerations and consequences of installing WHR system and scrubber. 6.6 Effect of WIF and scrubber system on water demand. 6.7 Pump and cooler optimization	PowerPoint slides	C9 (2 hours)
GREEN SHIP CONCEPT- 8500 TEU Container ship concept study (Part 3) 6.0 Developed energy saving and exhaust gas cleaning technologies. 6.8 Ballast treatment system 6.9 LNG for aux. engine in harbor mode	PowerPoint slides	C10 (2 hours)

6.10 Other means to reduce propulsion power advanced rudder, hull devices and paint. 6.11 Effect on electric balance 6.12 Economical consequences associated with implementing emission technologies. 6.13 Result on emissions using developed technologies. 7.0 Emerging Technologies 7.1 Air Lubrication and/or micro bubbles 8.0 Operations 8.1 Lines optimization 8.2 Ship speed, including derating of main engine 8.3 Fuel consumption and CO_2 emissions based on load profile.		
GREEN PASSPORT (Part 1) 1. Introduction 1.1 Background 1.2 Objective 1.3 Scope of Application 2. Definitions 3. Materials to be listed in the IHM 3.1 Recording of HM in the IHM Part I 3.2 Threshold values of HM included in the IHM Part I 4. Basic concepts for the development and maintenance of the IHM 4.1 Overarching Principles 4.2 Accreditation and Certification 4.3 Training & Qualification 4.4 Supplier's Declaration of Conformity and Mat. Declarations 4.5 Sampling and analysis	PowerPoint slides	C11 (2 hours)
GREEN PASSPORT (Part 2) 5. Development and maintenance process of the IHM 5.1 Development process of the IHM Part I for New Ships 5.2 Development process of the IHM Part I for Existing Ships 5.3 Development process of the IHM Part II 5.4 Development process of the IHM Part III 5.5 Life cycle management 6. Survey and Certification 7. Enforcement 7.1 Port State Control in accordance with Directive 2009/16/EC 7.2 Port State Control in accordance with the SRR	PowerPoint slides	C12 (2 hours)
CODE ON NOISE LEVELS ON BOARD SHIP (Part 1) Chapter 1 - General Chapter 2 - Measuring Equipment Chapter 3 - Measurement Chapter 4 - Maximum Acceptable Sound Pressure Levels Chapter 5 - Noise Exposure Limits	PowerPoint slides	C13 (2 hours)
CODE ON NOISE LEVELS ON BOARD SHIP (Part 2) Chapter 6 - Acoustic Insulation Between Accommodation Spaces Chapter 7 - Ear Protection and Warning Information Appendix 1 - Format for Noise Survey Report Appendix 2 - Guidance on the Inclusion of Noise Issues in Safety Management Systems Appendix 3 - Suggested Methods Of Controlling Noise Exposure Appendix 4 - Simplified Procedure for Determining Noise Exposure Appendix 5 - Provisional Guidelines on Maximum Acceptable Noise Level at Listening Posts	PowerPoint slides	C14 (2 hours)

References

1. MARPOL 73/78 Annex VI Directive 2005/33/EC;
2. MEPC of the IMO, Chapter 4 from MARPOL Annex VI;
3. Lattanzio R.K., "Clean Air Act: A Summary of the Act and Its Major Requirements", Congressional Research Service (CRS), 2022
4. Kjølholt, J., Aakre, S., Jürgensen, C., Lauridsen, J. "Assessment of possible impacts of scrubber water discharges on the marine environment", Miljøstyrelsen Denmark, 2012;
5. MARPOL CONSOLIDATED EDITION, I.M.O., 2006
6. Marine Environment Protection Committee (MEPC);
7. MEPC 59th session, July 2009;
8. Resolution MEPC 212 (63), 2012 GUIDELINES ON THE METHOD OF CALCULATION OF THE ATTAINED ENERGY EFFICIENCY DESIGN INDEX (EEDI) FOR NEW SHIPS;

8.2 Project	Teaching method	Observations hours
-Individual allocation of a ship from the following categories: oil tanker, bulk carrier, carrier container vessels, tugs, at free will of master student. -Defining the tests / analysis needed for ship evaluation by pollution viewpoint. -Calculus of the EEDI index for a new ship, chosen at P1, -Study of the actual regulations and describe at least 2 technology methods for improving the ship efficiency and estimate how much will be improved EEDI index. -Naval traffic noise measurements on Danube River shore, -Water river analysis; certificate model. -Sea water analysis; certificate model. -TDS water quality tester; calibration method. -Debate of project with every master student.	Cases study, explanations, development of the critical thinking	P1 (2 hours) P2 (2 hours) P3 (2 hours) P4 (2 hours) P5 (2 hours) P6 (2 hours) P7 (2 hours) P8 (2 hours) P9 (2 hours) P10 (2 hours) P11 (2 hours) P12 (2 hours) P13 (2 hours) P14 (2 hours)

References

1. Commission for Environmental Cooperation (2001) *The North American Mosaic: A State of the Environment Report* (Commission for Environmental Cooperation, Montreal);
2. Kristenen H.O. (2015) *Energy demand and exhaust gas emissions of marine engines* (HOK Marineconsult ApS, Technical University of Denmark);
3. Technological University of Denmark (DTU) &University of Southern Denmark (2013) "*Calculation tool for assessment of ships' energy consumption and fuel gas emissions, including CO_2_ (EEDI)*", (Danish Maritime Fund);
4. Olmer, N., Comer, B., Roy, B., Mao, X. & Rutherford, D. *Greenhouse Gas Emissions from Global Shipping, 2013–2015* (ICCT, 2017);
5. Procedure for calculation and verification of the Energy Efficiency Design Index (EEDI), (Rev.1- 2016) "*2015 Industry Guidelines for calculation and verification of EEDI*"

9. Subject relevance to the epistemic community representatives, to professional associations and main employers in fields significant for the programme.

The object has a strong educational character in order to model a good research and practitioner master student in naval architecture domain. The object has three experimental chapters: calculus of EEDI index for a new ship, the noise influence of port activities upon human adjacent communities and water analysis.
The purpose is that the master student to accumulate the practical knowledgeable regarding the environment pollution (EEDI index and environmental parameters) by lectures and project activities. By the content, the object desires to assure to master student, via lectures activities and project, the following knowledges, and abilities:
- acquiring the main parameters regarding ship energy efficiency, case study.
- acquiring evaluation procedures to measure water quality.
- acquiring methods to evaluate the influence of noise generated by port activities (loading-unloading, transport on roads and railways, crane lifting, vessels maneuverings etc.) upon adjacent human collectives.
- acquiring processing techniques of data resulted from measurements of traffic noise, case study.
- acquiring the knowledge for the assessment of environment by pollution point of view

These competencies are required on the work market by employers, from Romania or foreign, involved in research and design activities in naval architecture field, employers which build and/or repair ships.

10. Assessment

Activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of the final grade
10.4 Lecture	- understanding and assimilation of particulars knowledge of the subject - building the basis of reasoning needed in design and research activities for the analysis of pollution, according to criteria of naval classification societies (Tier curves)	The final examination is composed of two items as followings: - verification by a case study of the environment assessment and analysis abilities. - level of techniques knowledge in environment evaluation by pollution viewpoint onboard ship.	30%
		Presence at lectures, debates participation, stimulation of critical reflection	30%
10.5 Project	Presence at all project hours	Work in teams of 4 - 6 master students per instruments group	20%
	Elaboration of the project	Project evaluation which quantifies the implication and validation of results. In addition the master student shows the final content of the project.	20%
10.6 Minimum performance standard (Every item is standard recorded in the reference system 1 - 10)			
• The master student must perform all project hours and must finalize the project. • Final examination and the project must be graduated with grade 5.			