Marine Engineering Double Degree (Master)

Appendix 1 Module description

Module name	**ME235141 – Marine Propulsion Technology (PM03)**
Responsible lecturer	Prof. Dr. I Made Ariana, S.T., M.T. Prof. Semin, ST, MT, PhD
Content	1. Energy efficiency index of the ship 2. Optimization of propulsion system selection and design 3. Analysis of energy saving devices in the propulsion system 4. Application of CFD (Computational Fluid Dynamics) methods in analyzing propulsion system performance 5. Advance Prime Mover & Propulsor 6. Special ship propulsion system
Qualification aim	Students can optimize the design and operation of ship propulsion systems based on the ship's energy efficiency index and support the net zero emission program
Teaching language	English
Kinds of teaching	Lesson and seminars
Prerequisites	Non
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and successful passing of exam; kinds of exam are written test, oral test, or alternative test.
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 credits according ECTS
Offer period	Semester odd (1)
Time of Module	1 semester
Literature	Journals like Fuel; Fuel management and Policy; Combustion Books: Kowalewicz, Andrzej., 1984. Combustion System of High-Speed Piston I.C. Engines, Wydawnictwa Komunikacji i Lacznosci, Warszawa Heywood, J.B., 1988. Internal Combustion Engine Fundamentals, McGraw-Hill, Singapore. Stone, Richard., 1997. Introduction to Internal Combustion Engines- Second Edition, SAE Inc., USA Ganesan, V., 1999. Internal Combustion Engines Second Edition, Tata McGraw-Hill, New Delhi

Module name	**M235142 – Marine Machinery Systems (PM01)**
Responsible lecturer	Prof. Dr. Ir. Agoes Santoso, M.Sc., M.Phil. Sutopo Purwono Fitri, S.T., M.Eng., Ph.D.
Content	1. Marine refrigeration system 2. Shipboard ventilation system 3. Hydraulic system 4. FPSO top side machinery systems 5. Combat management system
Qualification aim	Students can understand and explain machinery systems on ships and sea vehicles related to fluid machinery systems, HVAC, auxiliary machinery, and combat management systems. Students can select and apply applications for thermal and fluid machinery systems, auxiliary machinery, and combat management systems
Teaching language	English
Kinds of teaching	Lessons, seminars, exercises, case studies, teamwork projects
Prerequisites	No
Usability	Usable in Master of Marine Engineering Double Degree
Requirements to award credits	Successful passing of exam; kinds of exam are written test, oral test or alternative test.
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 Credits according ECTS
Offer period	Semester odd (1)
Time of module	1 Semester
Literature	1. ASHRAE, Handbook Refrigeration – SI Edition, 2018 2. Mather, A. Floating Production, Storage And Offloading (FPSO) Handbook, Witherby Seamanship International, 2009 3. Johnston, W.A., Freezing and Refrigerated Storage in Fisheries, FAO, 1994 4. Walters, R. B., Hydraulic and Electric-Hydraulic Control Systems, Springer, 2017

Module name	**ME235143 – Marine Electrical Systems (PM 02)**
Responsible lecturer	Dr. Adi Kurniawan, ST, MT
Content	- Several types of electrical distribution systems on ships - Power flow analysis - Integration of renewable energy power plants
Qualification aim	Students can analyze power flow in several types of electrical distribution systems on ships. Students can design appropriate ship electrical systems with the integration of renewable energy
Teaching language	English
Kinds of teaching	Lectures and tutorials
Prerequisites	None
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and successful passing of exam; kinds of exam are written test, oral test, or alternative test.
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 credits according ECTS
Offer period	Semester odd (1)
Time of Module	1 Semester
Literature	M. Patel, “Shipboard Electrical Power Systems”, CRC Press

Module name	**ME235144 – Maritime Safety: Risk, Environment & Law (PM 05)**
Responsible lecturer	Sutopo Purwono Fitri, ST, MEng, PhD
Brief description	This course aims to provide students with an in-depth understanding of risk and safety management from a marine perspective and application to achieve economic, ecological, and social sustainability. Lecture material includes prerequisite material, processes and tools related to risk management, including risk assessment, management systems and safety culture, and risk management methodology. In addition, this lecture aims to provide basic skills in the concept of risk assessment, opportunities and impacts of risk occurrence, preventive actions, preparedness and contingency planning, monitoring, and improving frameworks in relation to risk management. In this lecture, after students have learned about risk assessment methods, they will be taught about the impacts of hazards that can affect the environment as well as the laws that apply to prevent environmental impacts due to the operation of marine facilities.
Content	1. Risk anatomy and general risk management framework 2. Identify hazards and introduce hazard analysis tools that can be used 3. Frequency Modeling, Consequence Modeling, Interpretation of risk levels 4. Recommendations to mitigate risks 5. National/international laws regarding environmental impacts due to hazards arising from the operation of sea vehicles
Qualification aim	1. Students can understand the basic concepts of risk and safety 2. Students can understand safety culture and work processes in building a safety management system 3. Students can explain the legal aspects of risk assessment, and demands for compliance with standards, risks, safety, and security. 4. Students can apply opportunity theory, apply risk management methodology, and use tools to identify, analyze, evaluate, and reduce risks. 5. Students can demonstrate an understanding of preparedness planning and contingency planning in the context of risk and safety management.
Teaching language	English
Kinds of teaching	Lesson, seminars, exercises, laboratory, field trips, team work projects
Prerequisites	None
Usability	Usable in Master Marine Engineering
Requirements to	Assignment and Successful passing of examination; kinds of

award credits	exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 according ECTS
Offer period	Semester odd (3)
Time of module	1 Semester
Literatur	1. Guidelines for Process Hazards Analysis, Hazards Identification & Risk Analysis, Nigel Hyatt, Dyadem Press 2003 2. A Guide to Quantitative Risk Assessment for Offshore Installations, JohnSpouge (Principal Author), DNV Technica 1999. 3. Statistics for Business and Economics, Anderson, Sweeney, and Williams, West Publishing Company 4. Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Prentice Hall. 5. Statistical Procedures for Engineering, management, and science, McGrawHill.

Module name	**ME235145 – Marine Operation & Maintenance (PM 04)**
Responsible lecturer	Dr Eng Dhimas Widhi Handani, ST, MSc AAB Dinariyana Dwi P, ST, MES, PhD
Brief description	This course studies the operation and maintenance of shipping systems and marine structures in general, strategies and methods for maintenance planning, reliability and availability of equipment and systems, condition monitoring, analysis methods for establishing maintenance programs, namely "Reliability Centered Maintenance" (RCM), Systems computer-based for maintenance management and spare part control.
Content	1. Introduction to Marine Operation System 2. Fuel Oil and Monitoring System 3. Lubrication Oil and Monitoring System 4. Cooling Water System, Fresh and Wastewater System 5. Document for Operation - Engine operation logbook 6. Introduction to RAM and Maintenance Relation 7. Lifetime Data Analysis 8. Failure Characteristics and Maintenance Techniques 9. Maintenance Business Process 10. Maintenance Organization, Planning and Scheduling 11. Maintenance Audit & Gap Analysis 12. Spare Part Management
Qualification aim	1. Students are able to determine strategies and methods for maintenance and inspection including preventive maintenance, corrective maintenance and condition monitoring. 2. Students can calculate the reliability and availability of shipping system equipment and marine buildings. 3. Students are able to analyze and optimize the operation and maintenance of shipping systems and marine structures. 4. Students can create a maintenance and spare parts management system with computer assistance (CMMS).
Teaching language	English
Kinds of teaching	Lesson, seminars, exercises, laboratory, field trips, teamwork projects
Prerequisites	None
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 according ECTS
Offer period	Semester odd (1)

Time of module	1 Semester
Literatur	1. The Maintenance Management Framework: Models and Methods for Complex Systems Maintenance; Crespo Márquez, Adolfo. 2. System reliability theory: models, statistical methods, and applications; Rausand, Marvin & Høyland, Arnljot. 3. Reliability of safety-critical systems: theory and applications; Rausand, Marvin. 4. An introduction to predictive maintenance; Mobley, R. Keith 5. Machinery Condition Monitoring - Principle and Practice; Amiya R. Mohanty, 2015. 6. Strategic Maintenance Planning, Anthony Kelly, 1st ed, Elsevier 2006. 7. Managing Maintenance Resource, Anthony Kelly, 1st ed, Elsevier 2006. 8. Maintenance Systems and Documentation, Anthony Kelly, 1st ed, Elsevier 2006. 9. Vibration Monitorng: ISO 10816-3 Guidelines 10. Condition monitoring and diagnostics of machine systems — Tribology-based monitoring and diagnostics — Part 1: General requirements and guidelines: ISO 14830-1:2019 11. Other references from International Journal, internet, news, etc.

Module name	**ME235241 – Research Methodology (PM 09)**
Responsible lecturer	Dr. Hilgenfeld M.Sc.
Content	Scientific papers: Structure, content, research in focus area, citation styles and authorship. Layout an own paper: Very professional operating with MS Word, quotation in Word Evaluate scientific documents (papers, articles, research proposal): Kinds of publications, Hirsch factor, Impact factor, peer review system, international publications, Presentation technics: Creation of scientific presentations, feedback rules, spontaneous reaction to changed presentation focus, regional studies (Germany) with presentation. Capturing measurement data: Kind of data, measurement mistakes, visualization of data (e.g. line, bar, boxplot). Research programs: Understanding of research calls (European Union). Creation of own research proposal: Presentation of the idea (Documentation based on the HSW internal research program)
Qualification aim	With the successful result of the examination the students are able to generate complex scientific papers (e.g. final thesis). Furthermore, the participants have the knowledge and skills to write professional articles and research proposals.
Teaching language	English
Kinds of teaching	Lessons, seminars, exercises, self-study, and self-prepared presentations.
Prerequisites	Non
Usability	Usable in Master Marine Engineering and Master in Operation and Management of Maritime Systems
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 Semester
Literature	will be given later

Module name	**ME235242 – IT Data Sciences (PM 07)**
Responsible lecturer	N.N.
Content	**Introduction and overview:** sources of data and basic programming knowledge (conditionals, loops, variables and functions), **Sources and quality of data:** **Structures of data**: structured, non-structures and semi structured data **Types of data:** CSV, Jason, xml, Metadata etc. and conversion **Handling of data:** saving, sorting and importing, validation and verification Database and Non-databased systems: principal setup, ERM models, relational database model, special types of SQL, structure, writing and reading, **Data integration:** - processing, algorithm, assessment and evaluation of data - selecting data from complex datafiles, with relation to context of interest, linear regression and distribution. visualising results displaying in two and multidimensional graphics, multiple graphics,
Qualification aim	Skills and knowledge in computer-based data sciences for analysis of key information and relations for technical applications
Teaching language	English
Kinds of teaching	Lesson, seminars, exercises, self-study and self-prepared presentations.
Prerequisites	- Basic knowledge in ship building
Usability	Usable in Master Marine Engineering and master in Operation and Management of Maritime Systems
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 Semester
Literature	Rules for classification and construction

Name of Module	**Sustainable Ship Operation (PM 08)**
Subject	Prof. Dr.-Ing. Rom Rabe
Content	This subject handles topics from retrofit solutions until new building solution which pursuing the aim to reduce the emissions from vessel. The focus in here is pointing four sublines - Rules and regulation: the focus is on global common rules and local rules like European, US or Chinese special regulations - Technology: what kind of technology is suitable to reduce the demand of fuel consumption in all, whereby the technology considers the retrofit solution but also newbuilding solutions - Fuel technology: this topic handles conventional but also alternative fuels including electrical propulsion solutions - Operative solutions: it is focusing on sustainable operational measures and activities to reduce the fuel consumption and enhance the energy efficiency
Aim of qualification	That subject introduce the students about all regulations with focus on emission reductions born by vessel operation and available measures that are serving that aim. Students knowing the pro and contra of several giving solutions and being able to decide for the right solutions for a given vessel.
Prerequisite for participation	none
Language	English
Kind of teaching	Lesson and exercise
Usability	This module is applicable in the Master degree course Marine Engineering
Criteria to gain credits	Assignment and successful passing of examination in written form (120 minutes) or oral exam (30 minutes) or alternative examination
Number of credits	5 CR according ECTS
Work load	180 hours, 4 hours per week are in attendance
Duration of module	1 semester with 4 swh seminar-based teaching
Literature	- MCN guideline
Reviewer	

Module name	**ME235243 – Renewable Offshore Energy and Simulation (PM 06)**
Responsible lecturer	Prof. Dr.-Ing. Axel Rafoth
Content	Renewable Offshore Energy General aspects of Wind energy, technology, controls, simulation, Special aspects of Offshore wind energy, environmental conditions, converter platforms, Simulation of Wind turbine components and systems • Grid, transmission lines, • Insulated systems • generator, • converter, • controls
Qualification aim	Ability to define complex technical systems, to do analyses using mathematical tools, to approach problems with right methodology, Discussion and right valuation
Teaching language	English
Kinds of teaching	Lesson, seminars, exercises, laboratory, optionally field trips
Prerequisites	Non
Usability	Usable in Master Marine Engineering
Requirements to award credits	Laboratory sheet and successful passing of exam; kinds of exam are written test, oral test or alternative test.
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 semester
Literature	Grid Integration of Wind Energy Conversion Systems Mohan Undeland Robbins, Power electronics Power System Stability and Control, Prabha Kundur

Module name	**ME235251 – Integrated Manoeuvring/Propulsion and Navigation Systems (WPM)**
Responsible Persons	Prof. Dr.-Ing. Siegl
Contents	Integrated Manoeuvring/Propulsion Systems: Design, Application, pros and cons for propulsion and steering of subsequently systems: – Azimuth-Propeller/Azipods – Voith Propeller and rotating rudder propellers – Waterjet-Thrusters – Wing-in-Ground Effect Vessels – Propulsion systems based on alternative Energy. – Sails, kites – Flettner Rotors, others – Simulation exercises and case studies for those specific vessels. Navigation System: – Additional features by integration – Parameter analyzing of important functions. – Network and system redundancies – Modern bridge configuration – Failure scenarios and options for action
Qualification aim	Enabling students to widely understand the principles of modern propulsion/manoeuvring systems as well as ship handling simulation systems with respect to technical concepts, characteristics and range of application, discussion of pros & cons in relation to complex analyses of energy, environmental and safety aspects.
Teaching Language	English
Prerequisites	Non
Usability	Master in Marine Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 semester
Literature	*Will be given later*

Module name	**ME235252 – Operation, Monitoring & Maintenance of Technical Systems (WPM)**
Responsible Persons	Prof. Dr.-Ing. Rom Rabe, Dr.-Ing. Ulrich Förster
Contents	Overview: – Elementary supervision stages; Design, manufacturing and testing, primary acceptance, putting into service, maintenance, and repair, and recurrent in-service supervision. Basic theoretical and practical aspects of international methods and requirements of plant supervision. Maintenance: – Advantages and disadvantages of different maintenance strategies; Availability and reliability; Optimization methods. Technical Diagnostic: – Theoretical Aspects and methods of Technical Diagnostic; Selection of special diagnostically tools and processes; Web based services and long-time analysis. Applications & Tools: – TITAN und GLSM. Classification: – Condition based Survey. Specific Samples: – Fired and unfired pressure equipment plants with respect to economic aspects.
Qualification aim	The students know how to prepare, perform and document a standard-compliant put into service, supervision as well as safety and environment relevant assessment of technical plants. They have the knowledge to optimize around the availability and reliability. The students are familiar with advantages and disadvantages of the various maintenance strategies trust and by specific application of methods of the technical diagnosis the advantages of the condition-based maintenance can be realized.
Teaching language	English
Kinds of Teaching	Seminars, self-study
Prerequisites	Non
Usability	Laboratory sheet and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Requirements to award credits	Successful passing of examination
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 semester
Literature	*Will be given later*

Module name	**ME235253 – Maritime Communication (WPM)**
Responsible lecturer	Mrs. Buttler Dipl. Pädg.
Content	The students shall improve through discussion and presentation of maritime technical problems their skills and knowledge in English
Qualification aim	Students can understand, follow, and conduct qualified professional English discussion, as well as be able to communicate correctly in written form, particularly with view on maritime professional topics.
Teaching language	English
Kinds of teaching	This course will be offered as blended learning with 50 % contact time (seminars) and 50 % with E-learning content (self-study).
Prerequisites	Non
Usability	Usable in Master Marine Engineering
Requirement to award credits	Successful passing of exam; kinds of exam are written test, oral test, or alternative test
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester even (2)
Time of module	1 semester
Literature	*will be given later*

Module name	**M235341 – Maritime Economics (WPM)**
Responsible lecturer	Prof. Raja Oloan Saut Gurning, ST, MSc, PhD.
Content	The micro foundations of maritime economics: Traditional framework for maritime economics; game theory for freight rates; Shipyard, scrap, and secondhand market; the supply of vessels – the impact of shipyard capacity; how expectations freight rates are generated; time charter market. The macro-economics of shipping markets: the efficiency of shipping market – martingale model and random walk model; maritime business cycle, the economic and statistical interpretation of business cycle, fiscal policy in maritime business cycle; Theory of shipping cycles – the Tinbergen Koopman's model, an integrated model of business and shipping cycles; The market structure of shipping and ship finance. The financialization of shipping markets: asset-led business cycles; hedging and speculation; the financialization of oil tanker market; structural changes of oil tanker market; the financialization of dry bulk market; solving the puzzles of structural changes. The interaction of business and shipping cycles: freight rate as leading indicator, the stylized facts of shipping factors; uncertainty-lead shipping cycles; business cycle in Japan, Germany and Indonesia, financial-lead shipping cycles Investment strategy: The major decisions in shipping, when to invest and sell in the market; case studies in dry bulk and tanker;
Qualification aim	Students can analyze the macro and micro determining factors that impact shipping business, cycles, and performance. Including apply investment strategy in preparing the financialization of various shipping market particularly on tanker, dry bulk, and container
Teaching language	English
Kinds of teaching	Lessons, seminars, economic model exercises, case studies, teamwork projects
Prerequisites	Maritime Business (Bachelor level), Maritime Economics (Bachelor level)
Usability	Usable in Master Engineering of Marine Engineering
Requirements to award credits	Successful passing of exam; kinds of exam are written test, oral test, or alternative test.
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 Credits according ECTS
Offer period	Semester odd (1)
Time of module	1 Semester
Literature	Stopford M.: Maritime economics. Branch, A.E.: Economics of Shipping Practice and Management. Karakitsos, E & Varavides L: Maritime economics; a macroeconomic approach Further references will be submitted during the course

Module name	**ME235342 – Efficient Ship and Fleet Operation (PM 11)**
Responsible lecturer	Dr.-Ing. Wolfgang Busse
Content	Ship & fleet management: Key Performance Indicators (KPI's) in shipping; Commercial, navigational & technical ship operation; Technical ship management - objectives, tasks, processes, resources; Integrated maritime management information systems. Technical performance and commercial performance: Costs (fixed, operating, voyage costs), revenue, financial performance, commercial value of a ship; Technical performance parameters, availability, reliability, power performance, energy efficiency, safety and environmental performance; Influence of technical performance on financial performance and commercial value; Influence of the O&M strategy. Efficient performance management and asset management of ships: Technical assessment and commercial valuation of ships; Voyage and vessel performance monitoring; Operating and maintenance cost structure; Ship performance and ship value versus operating and maintenance costs; Condition monitoring and condition-based maintenance; Maintenance versus replacement; Economics of technological change; Ship lifecycle and lifetime cost management. Energy efficiency in shipping: Optimization and management of ship and company energy efficiency (using EEOI, SEEMP, CEEMP); Integrated approach to vessel energy efficiency. Efficiency in regulatory compliance: effective and efficient implementation of regulations (IMO, Flag State) and certificate management;
Qualification aim	Students are able to analyses the economic consequences of various maritime technical management decisions, and to organise, monitor and control maritime-technical processes well-performing and efficiently
Teaching language	English
Kinds of teaching	Lessons, seminars, simulator exercises, case studies, teamwork projects
Prerequisites	Technical Ship Operation (Bachelor level) Complex Ship Operation Laboratory (Bachelor level), Maritime Economics (Bachelor level)
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester odd (3)
Time of module	1 Semester
Literature	Stopford M.: Maritime economics. Branch, A.E.: Economics of Shipping Practice and Management; Further references will be submitted during the course

Module name	**ME235343 Risk Based Design and Marine Evacuation (WPM)**
Responsible lecturer	Prof. Dr Ketut Buda Artana, ST, MSc Dr.Eng. Trika Pitana
Contents	Marine Evacuation: Human behaviors in case of fire and smoke spreading; Human ingress in case of marine accident, such as fires, ship healing, trim, smoke spreading.; Human response time in case of fire; Several types of marine evacuation; The walking speed of human; Simplied marine evacuation analysis; Advances marine evacuation analysis; Fire Modeling using Fire Dynamic Simulator Risk Based Design: Introduction Risk Based Approach in Maritime Industries; Risk Based Ship Design; Regulatory Framework; Risk Based Approval; Method and Tools; Application
Qualification aim	Students are able to conduct marine evacuation analysis during ship design by using simplified and advanced evacuation analysis as well as investigating marine casualties in terms of marine evacuation. Students are able to conduct risk-based design analysis for such as fire and safety plan evaluation and evacuation route plan.
Teaching language	English
Kinds of teaching	Lectures and tutorials
Prerequisites	None
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Workload	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	5 credits according ECTS
Offer period	Semester odd (3)
Time of module	1 semester
Literature	Will be given later

Module name	**ME235344 - Engineering Design Modelling & Simulation (PM 12)**
Responsible person	Dr. Achmad Baidowi, ST, MT Sunarsih, ST, MEng, PhD
Brief description	This course provides basic skills in design philosophy, modeling, and methods as well as design optimization by considering various aspects related to design.
Content	1. Model taxonomy 2. Goal based marine design and optimization 3. Marine machineries system design 4. Ergonomic in Marine System 5. Engineering economics in Design.
Qualification aim	Students can apply and develop design concepts that meet effective, efficient, ergonomic, and environmentally friendly principles for systems on ships, sea crafts and floating buildings.
Teaching language	English
Kinds of teaching	Self-study
Prerequisites	75 credits for Master Thesis, 90 credits for colloquium
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Workload	900 hours
Credits	30 credits according ECTS
Offer period	Semester even (4)
Time of module	16 weeks
Literature	1. Coyne, R., Rosenman, M., Radford, A., Balachandran, M., & Gero, J. (1990). Knowledge-Based Design Systems. Addison Wesley. 2. Papanikolaou, A. (Ed.), 2009. Risk-Based Ship Design Methods, Tools and Applications, pp 1-31 + pp 138-141 3. C. Ptolemaeus, Ed., System design, modeling, and simulation: using Ptolemy II, 1. ed., Version 1.02. Berkeley, Calif: UC Berkeley EECS Dept, 2014. 4. S. C. Misra, Design Principles of Ships and Marine Structures, 0 ed. CRC Press, 2015. doi: 10.1201/b19041. 5. R. Hamann and J. Peschmann, “Goal-Based Standards and Risk-Based Design,” Ship Technology Research, vol. 60, no. 2, pp. 46–56, May 2013, doi: 10.1179/str.2013.60.2.001. 6. Guidance notes on: THE APPLICATION OF ERGONOMICS TO MARINE SYSTEMS, ABS, august 2013

Module name	**ME235345 – Data Analysis & Decision Making (PM 13)**
Responsible lecturer	AAB Dinariyana Dwi P, ST, MES, PhD
Brief description	The Data Analysis and Decision-Making course equips students with three approaches to decision making, namely statistical data analysis, mathematical modeling, and multi-criteria. The data analysis approach lets students analyze and interpret data in decision making. The material discussed in data analysis includes Regression Analysis; Data Mining, and Time Series Analysis and Forecasting. Analytical/mathematical modeling discusses decision making within the framework of operations research, including linear, integer, and goal programming, and its application in management and engineering. This course also provides students with several multiple criteria decision-making methods.
Content	Statistical Data Analysis Methods 1. Explorasi data 2. Analisis regresi 3. Data mining 4. Time series analysis and forecasting Decision Making Methods 1. Linear programming 2. Integer programming 3. Goal programming 4. Multicriteria decision making method based on the concept of preference/paired comparison, outranking and the concept of simple weighting and distance-based method
Qualification aim	1. Students can understand the concept of decision making in the context of data analysis, mathematical modeling, and multi-criteria 2. Students can use statistical data analysis methods to analyze real data to support decision-making. 3. Students can apply mathematical and multi-criteria approaches in decision making
Teaching language	English
Kinds of teaching	Lessons, seminars, laboratory work, case studies, small projects
Prerequisites	None
Usability	Usable in Master Engineering
Requirements to award credits	Laboratory works; and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Workload	
Credits	4 credits according ECTS

Offer period	Semester odd (3)
Time of module	1 Semester
Literature	1. S. Christian Albright & Wayne L. Winston (2017). Business Analytics: Data Analysis and Decision Making, 6th Edition. Cengage Learning. 2. Cliff Ragsdale. (2018). Spreadsheet Modeling and Decision Analysis, 8e. Cengage Learning. 3. Pratyush Sen and Jian-Bo Yang, Multiple Criteria Decision Support in Engineering Design, Springer-Verlag London Ltd., 1998

Module name	**ME235351 – Marine Control System (WPM)**
Responsible lecturer	Dr. Indra Ranu Kusuma, S.T., M.Sc.
Content	Mathematical models and modelling of physical systems especially for marine system, how to be described by differential and algebraic equations and represented by state-space models, transfer functions, and use of simulation models as tools for analysis and problem solving. Stability definition and performance in closed-loop feedback systems. Including linear vs. nonlinear systems, linearization, Laplace transform, time response, frequency response, block diagrams, Bode plots, feedback, and feed-forward control loops. Fundamental topology and architecture of marine control systems. Including Auto Pilot, Marine Propulsion Plant, Power management system, Minimalization of Fuel consumption.
Qualification aim	Students are able to design automatic control system with logically based on the theory by himself or cooperation with bigger teamwork.
Teaching language	English
Kinds of teaching	Lessons, seminars, case studies, self or/and teamwork projects,
Prerequisites	Automation Control (bachelor level) Marine Electrical and Automation System (Bachelor level)
Usability	Usable in Master Engineering
Requirements to award credits	Assignment and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 credits according ECTS
Offer period	Semester odd (3)
Time of module	1 Semester
Literature	1. Benjamin C. Kuo, “Automatic Control System”, 7’th edition. 2. Thor Fossen, Handbook of Marine Craft Hydrodynamics and Motion Control, Wiley, 2011. 3. Thor Fossen, Marine Control Systems - Guidance, Navigation, and Control of Ships, Rigs and Underwater Vehicles, www.marinecybernetics.com , 2002.

Module name	**ME235352 – Technical of Internal Combustion Engine (WPM)**
Responsible lecturer	Prof. Dr. I Made Ariana, ST, MT Prof. Ir. Aguk Zuhdi M.Fathallah, MEng, PhD
Content	Design construction and operation of internal combustion engines: engine cycle; operation parameter; engine configurations; engine examples; alternative power plant Combustion, fuels and lubrications: the use of fuel oils in the marine industry; classification and grades; composition; energy content; combustion process stage; influence of fuels oils on combustion performance; combustion of gas fuels; lubrication technology and systems Engine performance and characteristics: engine testing; engine set up; dynamometers principles and frictions factor; engine performance; engine performance maps. Combustion product and emission control: health and environmental significance of combustion products; quantification of gaseous exhaust emissions; assessment of particulate emissions and smoke; exhaust emission from shipping; exhaust control measures; methods to reduce NOX and SOX emissions
Qualification aim	This course studies the design and operation of internal combustion engines and its effect on performance, operation, fuel requirements, lubrication systems, emissions, and environmental impact
Teaching language	English
Kinds of teaching	Lessons, seminars, laboratory work, case studies, small projects
Prerequisites	Marine diesel (Bachelor level)
Usability	Usable in Master Engineering
Requirements to award credits	Laboratory works; and Successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 credits according ECTS
Offer period	Semester odd (3)
Time of module	1 Semester
Literature	Ferguson C.R and Kirkpatrick A.T. 2001. Internal combustion engine applied thermos-sciences, 2ndEd., John Welay and sons; Wright A.A. 2000.MEP Series, Volume3, Part 20 Exhaust Emissions from Combustion Machinery, Published by Institute of Marine Engineer; Sher E.1998. Handbook of Air Pollution from Internal Combustion Engines Pollutant Formation and control, Academic Press

Module name	**ME235353 – Safety of Navigation (WPM)**
Responsible person	Dr. Eng. M. Badrus Zaman, ST, MT
Contents	Safety of Navigation: Advance of safety of navigation, analysis of ship accidents, Human error analysis and modelling, understanding of regulation, Formal Safety Assessment, Implementation of navigation technology for safety, Understanding of ISM code, Environmental management on-board, in ports, at enterprises; planning, monitoring and documentation; Responsibilities of flag states: maritime surveillance regulations, ship reports and ship certification, verification, maritime casual investigations.
Course aim	Students are able to understand the scope of the safety of navigation in the ship, studying the regulations for the safety of navigation, understanding Human Factor analysis model as well as the use of methods in the evaluation of the implementation of a regulation, management of ship operations.
Teaching language	English
Kinds of teaching	Lectures and tutorials
Prerequisites	Non
Usability	Usable in Master Marine Engineering
Requirements to award credits	Assignment and successful passing of examination; kinds of exam are written test, oral test or alternatively test
Work load	180 hours: 64 hours (4 SWH) tuition, 116 hours (7,25 SWH) self-study
Credits	6 Credits according ECTS
Offer period	Semester odd (3)
Time of module	1 semester
Literature	Will be given later

Module name	**ME235441 - Master Thesis and Colloquium**
Responsible person	All teaching personnel in master program
Content	The thematic assignment of the master thesis is processed between student and tutor and considers following aspects: adaptable in the programmed outline and complexity scientific standard relevance to practice While the colloquium the topic of the master thesis and adjacent subjects are being discussed and main issues highlighted.
Qualification aim	The student shall prove the ability to apply the gained knowledge and skills to actual topics and problems in and of maritime systems under consideration of scientific methods. A student can argue gained results scientifically and integrate them into the practical routine in maritime systems. The master thesis is completed with passing of colloquium. The student shall prove the ability to present, discuss and defend his thesis.
Teaching language	English
Kinds of teaching	Self-study
Prerequisites	75 credits for Master Thesis, 90 credits for colloquium
Usability	Usable in Master Marine Engineering
Requirements to award credits	Positive assessment of Master thesis and successful passing of colloquium
Work load	900 hours
Credits	30 credits according ECTS
Offer period	Semester even (4)
Time of module	16 weeks
Literature	