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# MASTER OF SCIENCE, TECHNOLOGY AND HEALTH

2023-2024

YEAR 2

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## MARINE TECHNOLOGY

ERASMUS MUNDUS MASTER IN  
RENEWABLE ENERGY IN THE MARINE  
ENVIRONMENT

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PROGRAMME SUPERVISOR(S):

Guillaume DUCROZET



Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

## YEAR 2 - Autumn Semester

### CORE COURSES

Course code	Title	ECTS Credits
CONF	Conferences	-
EXPHY	Experimental Hydrodynamics	5
GCHYD	General Concepts of Hydrodynamics	4
MRENE	Marine Renewable Energy	5
NUMHY	Numerical Hydrodynamics	5
PROJT	Project	-
SGCHYD	Soutien - General Concepts of Hydrodynamics	-
WSINT	Wave-structure Interactions and Moorings	5
WWSSM	Water Waves and Sea States Modeling	4

### LANGUAGE COURSES

Course code	Title	ECTS Credits
CCE3	Cultural and Communication English	2
ESP3	Spanish Language	2
FLE3	French Language	2

# YEAR 2 - Spring Semester

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## CORE COURSES

Course code	Title	ECTS Credits
THESIS	Master Thesis or Internship	30
THESISMOBIL	Internship / Thesis project (outgoing students)	30

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Conferences [CONF]

*LEAD PROFESSOR(S): Zhe LI*

### Objectives

This course gathers different conferences organized within the course of the M2 MTECH-HOE (industrial partners, scientific communication, etc.).

The conferences are planned every year and consequently differ from one year to another. They are provided by university scholars, industrial partners, alumni, etc. in order to provide the students a general overview of the field of ocean engineering: challenges, working opportunities, etc.

### Course contents

The conferences are planned every year and consequently differ from one year to another. They are provided by university scholars, industrial partners, alumni, etc. in order to provide the students a general overview of the field of ocean engineering: challenges, working opportunities, etc.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	12 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Experimental Hydrodynamics [EXPHY]

LEAD PROFESSOR(S): *Félicien BONNEFOY*

### Objectives

To provide students with state-of-the-art knowledge on experimental fluid dynamics in the field of offshore renewable energy and ship hydrodynamics. Despite the development of numerical modelling, experimental approaches remain a major source of knowledge development in ship hydrodynamics and marine renewable energy. The contribution to the selection of adequate hypotheses and to the validation of analytical or numerical models is of primary importance. In numerous situations, the experimental approach remains the most reliable, economical and fastest way to validate new designs. Specific instrumentation and facilities are presented in this course and used in lab work.

### Course contents

Lesson 1 - Introduction to experimental hydrodynamics  
The students discover the main topics in MRE experiments.

Lesson 2 - Experimental ocean engineering  
Experimental tests in offshore basins.

Lesson 3 - Resistance  
Ship resistance and experiments in towing tanks. Reynolds and Froude similitude; extrapolation at full scale.

Lesson 4 - Ship manoeuvrability  
Mathematical formulation, experimental determination of hydrodynamic coefficients. Modelling of towed structures.

Lesson 5 - Measurements and signal processing  
Sensors and transducers, sampling theory. Signal processing, Fourier analysis.

### Course material

- S.A. Hughes, Physical Models and Laboratory Techniques in Coastal Engineering
- N. Newman, Marine Hydrodynamics
- O.M. Faltinsen, Sea loads on ships and offshore structures
- V. Bertram, Practical Hydrodynamics
- S. Chakrabarti, Offshore structure modelling

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	5	12 hrs	0 hrs	20 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## General Concepts of Hydrodynamics [GCHYD]

LEAD PROFESSOR(S): Lionel GENTAZ

### Objectives

The objectives of this course are to give a general overview to students about the use of Hydrodynamics in marine and ocean engineering fields, about modelling and physics of free surface flows, numerical simulation in Hydrodynamics, hydrostatics and stability of floating structures. This global overview will be then detailed in other courses of the Master program.

### Course contents

Lesson 1 - Industrial, R&D and research activities connected to free surface hydrodynamics and ocean engineering  
A state of the art of the problems of engineering or applied research use of Hydrodynamics is required.

Lesson 2 - Different classes of approximation used in Hydrodynamics  
Presentation of different mathematical models which can be used in Hydrodynamics to describe free surface incompressible free surface flows (Navier-Stokes equations, Euler equations, boundary layer equations, Potential flow model) and main problems of free surface Hydrodynamics for which each model is adapted.

Lesson 3 - Introduction to Numerical Simulation

- Methodology for numerical simulation of a physical problem
- Implementation of a numerical method
- Pre- and post-treatment
- High-performance computing
- Practical application : introduction to discretisation of partial derivative equations using finite difference schemes

Lesson 4 - Introduction to experimental approach in hydrodynamics

Physical problems which can be treated using experimental approach and related facilities (towing tang, wave tank ...) are presented.

Lesson 5 - Hydrostatic and Stability of ships and marine structures

Intact and damaged stability of floating structures are investigated through theoretical and practical aspects. Computer lab work is done with state-of-art industry software.

### Course material

- E. Guyon, J.P. Hulin, L. Petit L., hydrodynamique physique, InterEditions /Editions du CNRS
- J.N. Newman, Marine Hydrodynamics, The MIT press, 1977
- V. Bertram, Practical Ship hydrodynamics, Elsevier, 2012 (2nd Edition)
- A.J. Hermans, Water Waves and Ship Hydrodynamics: An Introduction, Springer, 2010 (2nd Edition)
- Biran, Ship Hydrostatics and Stability, Butterworth-Heinemann, 2003
- J.H. Ferziger, M. Peric, Computational Methods for Fluid Dynamics, Springer
- <https://ittc.info/downloads/proceedings/> : proceedings of ITTC conferences

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	4	20 hrs	4 hrs	6 hrs	0 hrs	2 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Marine Renewable Energy [MRENE]

LEAD PROFESSOR(S): Sandrine AUBRUN

### Objectives

To provide students with (i) a good understanding of the fundamentals of wind turbines, tidal turbines and wave energy converter performance and (ii) a first experience with the assessment of the performance of these technologies.

### Course contents

Part 1 - Fundamentals of turbine performance. This course is an introduction to the "offshore wind turbines" and "current turbine" classes. The objective is to understand the fundamentals of turbine performance, with a focus on marine applications. We will focus on the main operating principle of turbines, followed by the understanding of flow physics and performance of turbine blades operating in the marine environment.

Part 2 - Current turbines. This part of the course will describe, the resource, market and advanced technologies of current turbines. Experimental and numerical methods for studying current turbines will be outlined. An overview of current activities in the field of current turbines will be given. Numerical exercises will aim to calculate the performance of a current turbine in different operating conditions.

Part 3 - Offshore wind turbines. Firstly, this part of the course will provide general figures on the installed wind power capacity in the world and in Europe. Then, the components of a wind turbine will be detailed and the general operation principles will be described. Rotor technologies, drive-train and generators, as well as bottom fixed and floating foundations will be addressed. Park effects will be also outlined. Numerical exercises will be carried out in order to investigate the wind turbine aerodynamics, the park effects and to introduce to the challenges linked to the design of floating offshore wind turbines.

Part 4 - Wave energy converters The objective of this part of the course is (i) to give to the student a good understanding of the current status of wave energy conversion technologies in terms of potential and actual performance. Thus, it will address first the wave energy resource and market. A historical perspective of wave energy conversion will be given and an overview of the technology will be described. Fundamentals of wave energy conversion and energy performance will be highlighted. The energy performance of current technologies will be discussed as well as project development methodologies.

### Course material

- J. Falnes (2002) Ocean Waves and Oscillating Systems: Linear Interactions Including Wave-Energy Extraction. Cambridge University Press.
- J. Cruz (2008) Ocean Wave Energy: Current Status and Future Perspectives. Springer.
- B. Multon (2011) Marine Renewable Energy Handbook. Wiley.
- J.J. Newman; Marine Hydrodynamics, MIT press, 1977.
- I.H. Abbott, A.E.Von Doenhoff, Theory of wing section, Courier Corporation, 1959.
- J.F. Manwell, J.G. MCGowan & A.L. Rogers (2009) Wind energy explained - Theory, Design and Application. Wiley.
- M. C. Brower (2012) Wind resource assessment - A practical guide to developing a wind project. Wiley.

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	5	14 hrs	0 hrs	16 hrs	0 hrs	2 hrs



# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Numerical Hydrodynamics [NUMHY]

LEAD PROFESSOR(S): Lionel GENTAZ

### Objectives

The goal of this class is to provide students with an overview of Computational Fluid Dynamics (CFD) methods and the simulation environment for the computation of free-surface unsteady flows in ocean engineering. Different methods rely on different physical approximations of the wave-structure interaction problem. The latter approximations are based upon the space-time scales (from hours and km<sup>2</sup> to seconds and m<sup>2</sup>) of the investigated problems and the engineering objectives (energy conversion quantification, design for standard operation, extreme condition design, maintenance operations, etc.). According to the approximations made, different numerical methods can be developed and applied.

The primary objective is that students gain a clear vision of the use of different approximations and methods, and of their respective ranges of application, computational cost, human and resource cost of use, versatility, limitations, ease of use, space discretization (mesh), etc. The methods reviewed range from potential flow theory (BEM: Boundary Element Method, HOS: High-Order Spectral), to a full description of the Navier-Stokes equations (FD: Finite Differences, FV: Finite Volumes) associated with interface models (VoF: Volume of Fluid, LS: Level Set).

For each method, the mathematical model, discretization and implementation principles are explained. Turbulence modeling principles (RANS: Reynolds Averaged Navier-Stokes, LES: Large-Eddy Simulation, hybrid RANS/LES) are provided. The link with space discretization (structured surface meshes, unstructured volume meshes, meshless etc) is detailed. Numerical properties such as convergence, stability, consistency are reviewed.

Finally, the links between numerical method and current simulation environment are covered: existing commercial software, human and computational resources, choice of software depending on the targeted problem, link with hardware (High-Performance Computing, cloud resources) etc.

Practical projects using software based on different methods studied in class (BEM, FVM, etc.) are proposed to students with the use of commercial software or software developed at Centrale Nantes.

### Course contents

Lesson 1 - Knowledge and understanding of potential flow solvers  
Potential flow methods (BEM), Integral methods solving, Surface meshing, Hydrodynamic loading calculation

Lesson 2 - Numerical methods for free surface flows  
Volume discretization methods ( Finite Volumes), Time integration and stability,

Lesson 3 - Navier-Stokes equations solution techniques  
State of the art of CFD in hydrodynamics for Ocean Engineering  
Pressure-velocity coupling, Linear system solving, Volume meshing  
Hydrodynamic loading calculation, Interface methods (VoF, LS)  
Turbulence models (RANS, LES)

### Course material

- H. Lomax et al., Fundamentals of Computational Fluid Dynamics, Springer, 2011
- B. Andersson et al., Computational Fluid Dynamics for engineers, Cambridge Univ. Press, 2011
- J.H. Ferziger, M. Peric, Computational Methods for Fluid Dynamics, Springer, 1997
- J.F. Wendt, Computational Fluid Dynamics, an introduction, Springer, 2009
- R.H. Nichols, Turbulence Models and Their Application to Complex Flows, Univ. Alabama, 2012
- V. Bertram, Practical Ship Hydrodynamics, Elsevier, 2012

## Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	5	14 hrs	2 hrs	14 hrs	0 hrs	2 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Project [PROJT]

*LEAD PROFESSOR(S): Zhe LI*

### Objectives

This module contains specific projects carried on during the first semester of the M2 MTECH-HOE.

The projects are proposed each year and consequently differ one year from another.

### Course contents

This module contains specific projects carried on during the first semester of the M2 MTECH-HOE.

The projects are proposed each year and consequently differ one year from another.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	0 hrs	0 hrs	0 hrs	30 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Soutien - General Concepts of Hydrodynamics [SGCHYD]

LEAD PROFESSOR(S): Sandrine AUBRUN

### Objectives

Remind the minimum required knowledges on fluid mechanics to tackle the core lectures of the master program

### Course contents

#### Lecture 1

Fluid properties

Vectors and tensors

Why Partial derivatives?

Mathematical operators (del operator, grad, div rot)

#### Lecture 2

Hydrostatics, Euler equations

Pressure loads

#### Lecture 3

Dynamics of perfect fluids

Bernoulli equation

Extension to generalised Bernoulli Equation (head loss, hydraulic machines) no detail

#### Lecture 4

Stress tensors

NS equations

Similarity laws

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	10 hrs	0 hrs	10 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Wave-structure Interactions and Moorings [WSINT]

LEAD PROFESSOR(S): Pierre FERRANT

### Objectives

The objective of the first part of the course is to give a complete presentation of the available models for the determination of marine structure response in a seaway, emphasizing the advantages and drawbacks of each approach. A complete presentation of the linearized theory of wave-body interactions, treated in a deterministic sense, is first given. Both frequency domain and time domain approaches are described. Fundamental relations between both solutions are systematically emphasized. High and low frequency second order effects are explained and illustrated. Then, an overview of the available nonlinear theories and numerical models for wavestructure interactions is given. Different levels of approximation are described, from the simple addition of nonlinear hydrostatics to fully nonlinear time domain models.

The second part addresses the modelling of mooring systems. Different options in terms of mooring systems and arrangements are presented in order to give students the main information necessary for undertaking a mooring design process.

For both parts, lectures are completed by practical exercises based on state-of-the-art software for wave-structure interaction and mooring modeling, using both frequency domain and time-domain analysis. The topics of the practical sessions will be realistic ocean engineering problems such as the response of a floating wind turbine platform to waves, for example.

### Course contents

Lesson 1 - Objectives, theoretical framework

Lesson 2 - Short review of linear systems theory

Lesson 3 - Formulation of the boundary value problem. Linearization

Lesson 4 - Frequency domain approach

- Definition of diffraction and radiation sub-problems
- Hydrodynamic loads: added mass and damping
- Calculation of motions
- Relations between elementary solutions

5 - Time domain approach

- Forced motion of a floating body
- Formulation of the diffraction problem in the time domain
- Equations of motion
- Relation to frequency domain response

Lesson 6 - Second-order effects and introduction to non-linear models

- Drift forces
- Low and high-frequency loading in irregular waves
- Nonlinear hydrostatics and Froude-Krylov loading
- Weak scattered hypothesis
- Fully nonlinear models

Lesson 7 & 8 - Moorings for marine structure

- Some examples in Oil and Gas energy
- Different types of mooring systems

- Offloading operations
  
- Some examples in Marine Renewable energy
- Mooring main functions
- Mooring arrangement
- Mooring components
- Environmental conditions
- Mooring Design basis

## Course material

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- J.N. Newman (1977) Marine Hydrodynamics, MIT Press.
- O.M. Faltinsen (1990) Sea Loads on Ships and Offshore Structures, Cambridge University Press.
- Adrian Biran (2003) Ship Hydrostatics and Stability, Butterworth-Heinemann.
- API recommended Practice 2SK (2005) Design and analysis of Station-keeping Systems for Floating Structures.
- Vryhof anchors (2010) Anchor Manual, The Guide to Anchoring.

## Assessment

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Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	5	18 hrs	2 hrs	10 hrs	0 hrs	2 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Water Waves and Sea States Modeling [WWSSM]

*LEAD PROFESSOR(S): Guillaume DUCROZET*

### Objectives

This course provides an overview of some of the numerous mathematical models used to represent free-surface gravity waves and the associated underlying flow. The models are used to describe the main physical features of ocean wave propagation. The scope is voluntarily restricted to the most useful models generally used by ocean/marine engineers and researchers. In a few cases, a deeper theoretical insight is presented in order to allow the students to understand the subtleties of water wave theory and nonlinear physics. In the second part, the use of the statistical approach is presented, both for the representation of sea states and sea structures' responses.

After completing the course, students will be able to:

- Identify the wave theory adequate to model a given regular wave.
- Describe in detail the physics of dispersive waves.
- Develop or use numerical models for the wave propagation.
- Interpret and use Metocean data in the context of ocean engineering.

### Course contents

Lesson 1 - Introduction to marine environment

Description of the ocean and the different kind of waves. Focus on gravity waves and the processes responsible for their generation.

Lesson 2 - Gravity wave modelling

Derivation of the governing non-linear equations and introduction of the multiple scale method to generate a particular subset of equations

Lesson 3&4 - Dispersive waves

- Airy Potential; derivation of the solution by separation of variables. Expression of all the related physical quantities: group velocity, energy density, energy flux, limits of the linear model.
- Higher order Stokes solutions (3rd order, 5th order). Sequential construction of the Stokes higher order solutions. Specific nonlinear features of Stokes waves.
- Wave refraction and shoaling in coastal regions.

Lesson 5 – Shallow water (non-dispersive) waves

Derivation of the governing equations and analytical solutions to the problem: solitons and cnoidal waves.

Lesson 6 - Statistical models for wave field description

- Random sea state modeling.
- Usual wave spectra models.
- Wave generation.

Lesson 7 - Random responses of structures at sea

- Random responses of a linear system.
- Review of the results for ship responses by a deterministic theory.
- Motion on a real sea state.
- Extreme responses, and design factors.

### Course material

- Robert G. Dean & Robert A. Dalrymple, Water wave mechanics for engineers and scientists, Advanced Series on Ocean Engineering (vol.2).
- A.J. Hermans, Water waves and ship hydrodynamics: an introduction.
- C.C. Mei, M. Stiassnie & D.K.P. Yue, Theory and application of ocean surface waves, Advanced Series on Ocean Engineering (vol.23). Part I: Linear aspects; Part II: Non-linear aspects

## Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	4	14 hrs	4 hrs	12 hrs	0 hrs	2 hrs



# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Cultural and Communication English [CCE3]

*LEAD PROFESSOR(S): David TROYA*

### Objectives

Team-building and Communicational English:

- Understand the general concepts of team-building
- Build a team-building project
- Understand and nurture the creative process
- Enhance self-belief and self-empowerment

Behavioral skills in an inter-cultural environment:

- Strengthen self-confidence and capacity for interaction
- Develop active listening and reformulation skills
- Develop networking skills

### Course contents

Cultural and Communicational English: exercises to explore in practice the areas of culture and communication  
Field-related or inter-cultural project.

### Course material

Written and televised press, information and digital tools, general documents business environment and company strategies.  
Internet conferences (Ted Talks, etc.), our own educational materials on Hippocampus (Moodle).

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	2	0 hrs	32 hrs	0 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## Spanish Language [ESP3]

LEAD PROFESSOR(S): Marta HERRERA

### Objectives

For beginners:

Practice and reinforcement of the five skills (oral and written expression and comprehension as well as interaction)

Acquisition of vocabulary and linguistic structures

Be able to talk about yourself and those around you

Be able to express oneself during daily activities

Know how to give your opinion

For advanced students:

Practice and reinforcement of the five skills (oral and written expression and comprehension as well as interaction)

Acquisition of specialised vocabulary

Be able to understand the essential content of concrete or abstract subjects including a technical discussion

Be able to communicate spontaneously and fluently

Be able to express oneself in a clear and detailed manner, to express an opinion on a topical subject

### Course contents

For beginners:

Personal environment (introduce yourself, express yourself, your tastes, your character, your hobbies, etc.), your surroundings (friends, family, location, climate), your interests (sports, leisure)

Present tense (regular and irregular)

Language patterns to express habit, obligation, "gustar" and its equivalents,

Possessive adjectives

Differences between "es", "está", "hay"

Use of "por" and "para"

Adverbs and frequency patterns

Numeral adjectives

For advanced students:

Knowledge of the Hispanic world (economic, technical, cultural and social environment)

Present tense (regular and irregular)

Imperative

Past tenses

Direct / indirect style

Future tense

Conditional tense

Present and past subjunctive moods

### Course material

Preparation manuals, our own tailor-made documents, written and internet press, general civilization documents, digital tools

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
Spanish	2	0 hrs	32 hrs	0 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Autumn Semester

## French Language [FLE3]

LEAD PROFESSOR(S): *Silvia ERTL*

### Objectives

The objective is to familiarize the learner with the French language and French culture through an entertaining task-based communicative language teaching, focused on speaking combined with:

- Phonetics
- Self-correcting exercises on our learning platform
- Learning Lab activities
- Project work
- Tutoring

Course objectives include the acquisition and reinforcement of vocabulary, syntax, and pronunciation by both traditional means and through the use of digital resources. Students will learn general French, develop language skills of oral and written comprehension and expression.

After completing this course (32 hours + personal work), the students will be able to communicate in spoken and written French, in a simple, but clear manner, on familiar topics in the context of study, hobbies etc. Another important goal of this course is to introduce the student to French culture.

At the end of the course, complete beginners can achieve an A1 level and some aspects of the A2 of The Common European Framework of Reference for Languages. More advanced students may aim for B1/B2 levels. Those who already completed the first year of the French course will be prepared for working in a French business environment.

### Course contents

Two different tracks are proposed: track 1 for students newly arrived at Centrale Nantes and track 2 for students who have completed the first year of the French course. Track 1:

Full range of practical communication language exercises: reading comprehension, listening comprehension, written expression, oral expression.

Learners will be able to use the foreign language in a simple way for the following purposes:

1. Giving and obtaining factual information:

- personal information (e.g. name, address, place of origin, date of birth, education, occupation)
- non-personal information (e.g. about places and how to get there, time of day, various facilities and services, rules and regulations, opening hours, where and what to eat, etc.)

2. Establishing and maintaining social and professional contacts, particularly:

- meeting people and making acquaintances
- extending invitations and reacting to being invited
- proposing/arranging a course of action
- exchanging information, views, feelings, wishes, concerning matters of common interest, particularly those relating to personal life and circumstances, living conditions and environment, educational/occupational activities and interests, leisure activities and social life

3. Carrying out certain transactions:

- making arrangements (planning, tickets, reservations, etc.) for travel, accommodation, appointments, leisure activities
- making purchases
- ordering food and drink

### Track 2:

This track follows on directly from the first-year French course, developing and completing the concepts studied thus far. The main themes are: housing, health and work. These topics will help prepare students for their future work environment. For example, housing is explored in the form of a search for accommodation upon arrival in a new city. Special workshops for CVs and cover letters, elevator pitches and job interviews.

### Course material

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Preparation manuals, our own tailor-made documents, written and televised press, internet, general civilization documents, digital tools, our own educational materials on Hippocampus (Moodle).

### Assessment

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Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	2	0 hrs	32 hrs	0 hrs	0 hrs	0 hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Spring Semester

## Master Thesis or Internship [THESIS]

LEAD PROFESSOR(S): Zhe LI

### Objectives

- Be exposed to and adapt to an industrial or research environment
- Put in practice the scientific and technical skills acquired in the previous semesters
- Strengthen interpersonal and communication skills
- Be part of or manage a project
- Organize tasks, analyze results and build deliverables

### Course contents

Students should be pro-active and career-oriented in the search for their thesis/internship. The topics are validated by the program supervisor to ensure an adequate Master level. The thesis/internship is evaluated through the submission of a written report and an oral defense.

### Course material

- Turabian Kate Larimore, Booth Wayne Clayton, Colomb Gregory G., Williams Joseph M., & University of Chicago press. (2013). A manual for writers of research papers, theses, and dissertations: Chicago style for students and researchers (8th edition.). Chicago (Ill.) London: University of Chicago Press.
- Bui Yvonne N. How to Write a Master's Thesis. 2nd ed. Thousand Oaks, Calif: Sage, 2014.
- Evans David G., Gruba Paul, et Zobel Justin. How to Write a Better Thesis. 3rd edition. Carlton South, Vic: Melbourne University Press, 2011.

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	30	null hrs	null hrs	null hrs	0 hrs	null hrs

# Master Programme - Marine Technology - Erasmus Mundus Master in Renewable Energy in the Marine environment

YEAR 2 - Spring Semester

## Internship / Thesis project (outgoing students) [THEISMOBIL]

LEAD PROFESSOR(S): Zhe LI

### Objectives

- Be exposed to and adapt to an industrial or research environment
- Put in practice the scientific and technical skills acquired in the previous semesters
- Strengthen interpersonal and communication skills
- Be part of or manage a project
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### Course contents

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- Bui Yvonne N. How to Write a Master's Thesis. 2nd ed. Thousand Oaks, Calif: Sage, 2014.
- Evans David G., Gruba Paul, et Zobel Justin. How to Write a Better Thesis. 3rd edition. Carlton South, Vic: Melbourne University Press, 2011.

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	30	null hrs	null hrs	null hrs	0 hrs	null hrs