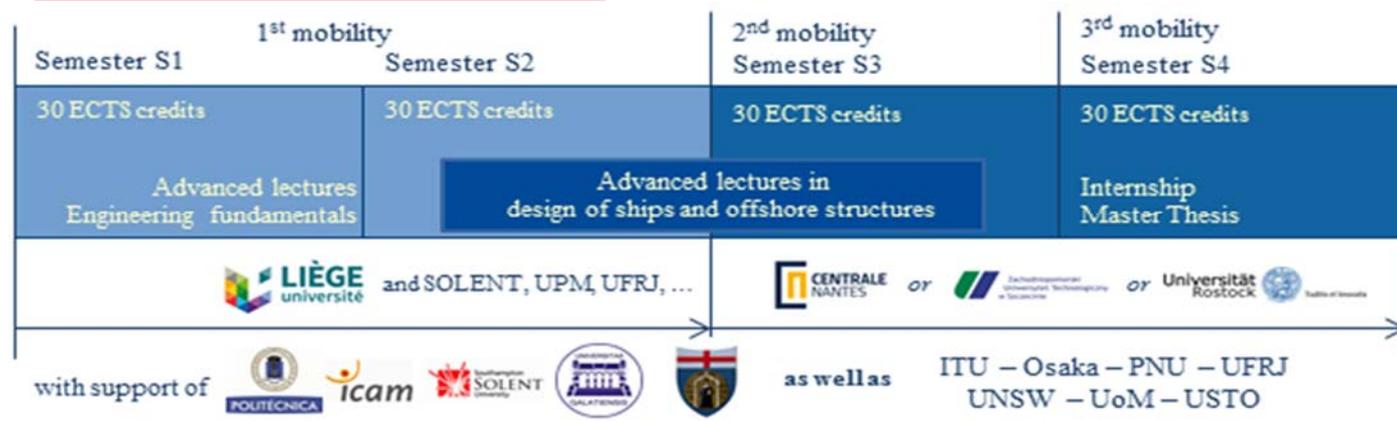


**AWARD CRITERIA****APPLICATION - EMSHIP<sup>+</sup>, EMJMD call – Feb 2019*****Advanced Design of Ships and Offshore Structures*****1. RELEVANCE OF THE PROJECT****Fig. 1.1: EMSHIP<sup>+</sup> Joint Master organised since Sept 2017****EMSHIP<sup>+</sup> History and Motivations**

This EMJMD application in “*Advanced Design of Ships and Offshore Structures*” concerns the “EMSHIP<sup>+</sup>” Master (Fig 1.1 and 1.2), launched with 8 students in Sept. 2017 and 15 in Sept. 2018.

The purpose of this application is to propose an up-to-date education programme in design and optimization of ships and offshore structures dedicated to maritime transportation and sustainable exploitation of oceans. Thanks to strong background and expertise, the EMSHIP<sup>+</sup> Consortium addresses major issues with this programme: fast technological evolution in the field of naval architecture, marine technology and offshore engineering, growing demand from companies for graduates combining up-to-date competencies and beyond this, societal challenges related to the global warming (necessity of energy savings, renewable energies, need for more efficient and less polluting transport modes...).

Compared to the application submitted in Feb 2018, this proposal includes a new Partner (University Polytechnic of Madrid - UPM) bringing its competences in Renewable Marine Energy, which will be the future 4<sup>th</sup> track for the 2<sup>nd</sup> year of the master, based on a joint degree.

*The Consortium is composed of 9 European partners (with 3 new partners compared to the former programme):*

- *4 Core Partners propose 3 double Master degrees: University of Liege (ULiège, coordinator, Belgium), Ecole Centrale de Nantes (ECN, France), University of Rostock (URO, Germany) and West Pomeranian University of Technology, (ZUT, in Szczecin, Poland), and*
- *5 Partners welcome students for internships and master thesis during the 4<sup>th</sup> semester: University of Genoa (UNIGE, Italy), Dunarea de Jos University of Galati (UGAL, Romania), ICAM School of Engineering (ICAM, Nantes, France), Southampton Solent University (SOLENT, UK) and University Polytechnic of Madrid (UPM, Spain).*

These 9 EU universities form the EMSHIP<sup>+</sup> Consortium. Formally, UPM is a new partner and as soon as the UPM-ULiège joint degree is accredited by ANECA (Spanish accreditation agency), the EMSHIP<sup>+</sup> Consortium will propose to EACEA this Joint degree, in addition to the 3 other double degrees (Fig 1.2).

UNIGE, UGAL, ICAM, SOLENT and UPM are European universities and members of the Consortium with practically the same level as the 4 Core Partners. They do not deliver degree but participate in the development of the EMSHIP<sup>+</sup> programme and are involved in each step of the education as the Core Partners. They are members of the Master Management Committee (Section 3.2) and co-signatories of the Consortium Agreement, which is not the case of the Associated Universities.

There are 8 other associated partners (Fig 1.4) including 7 non-European universities: Univ. of Michigan (UoM, USA), Osaka Univ. (OU, Japan), Federal Univ. of Rio de Janeiro (UFRJ, Brazil), Pusan National Univ. (PNU, South Korea), Univ. of New South Wales (UNSW, Australia), Istanbul Technical Univ. (ITU, Turkey) and National Univ. of Sciences and Technology of Oran (USTO, Algeria) and the EU association of universities in marine technologies (WEGEMT).

EMSHIP<sup>+</sup> EMJMD (Fig 1.1) will be a successful continuation of the former EMSHIP (EMMC) funded in 2010 for 5 cohorts by the EACEA (2010-0142) and 3 additional cohorts in 2015 through the EACEA Quality Review (2015-1687, Project 159652). Since 2010 (1<sup>st</sup> cohort), the EMSHIP Master successfully proposed an attractive double Master degree to 200 students from all over the world, with a sustainable long term perspective as 75 % of the students (cohorts 2015, 2016, 2017) were self-funded (see figs 4.1 and 4.2 and Annex A1: Recruitment).

For an easy understanding of this document, we will call “EMSHIP<sup>+</sup>” the new program in 120 ECTS (credits) proposed as EMJMD in 2019, and “EMSHIP” the former EM Master in 90 ECTS funded in 2010. In 2014, EMSHIP passed the EACEAs Quality Review and was included in the EMJMD Catalogue as “best practice”.

Main acronyms used in this proposal are:

EMJMD	<i>Erasmus Mundus Joint Master Degree</i>
EMSHIP	<i>Integrated Advanced Ship Design (Started in 2010, funded by EACEA for 8 cohorts)</i>
EMSHIP <sup>+</sup>	<i>Advanced Design of Ships and Offshore Structures (Started in Sept 2017)</i>
MMC	<i>Master Management Committee of EMSHIP<sup>+</sup></i>
NAOE	<i>Naval Architecture and Ocean Engineering</i>
SAB	<i>Strategic Advisory Board (composed of industrial partners – see Annex A4: SAB)</i>

Note: Due to the restricted amount of space, instead of using “he/she”, we use “he” to refer to a student or a candidate.

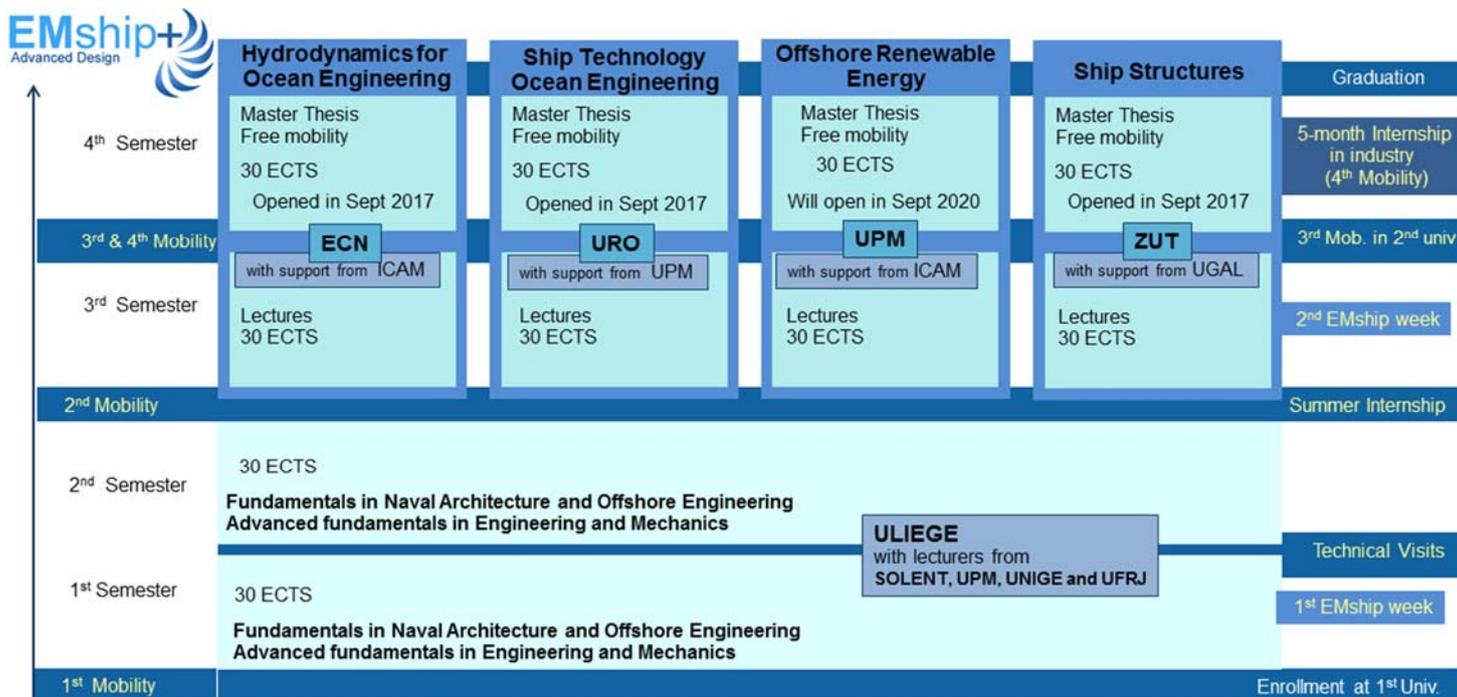


Fig. 1.2: EMSHIP<sup>+</sup> Master submitted to EM - EACEA with UPM (Madrid) as new partner

### 1.1 The proposal's elements of "jointness"/integration, design and structure are tailored and effective for achieving the EMJMD aims and objectives

The Consortium is based on the former EMSHIP programme, which ran successfully for 8 intakes. Based on this experience, the Consortium has significantly upgraded its programme (Annex D4) to better fit the long term objectives of the European Higher Education Area (internationalisation, sustainability, employability and high quality education). The new EMSHIP<sup>+</sup> is a Joint European MSc programme (120 ECTS) focusing on “Advanced Design of Ships and Offshore Structures”, with the support of a large network of Associated Partners: more than 25 Industrial Partners (Annex A4) and 7 non-European top ranking universities (Fig 1.4 and Annex C), as well as an active Alumni team.

The objectives of the programme require a strong Consortium covering all planned areas and having recognized education experience, a strong link between education and research and an active network with industries. The 10 years’ experience of the EMSHIP network has proven its excellence and its ability to run an integrated programme, where jointness is present at each stage as detailed in Annex B1: Jointness.

The EMSHIP<sup>+</sup> programme runs full-time over 24 months (120 ECTS) and consists of Master courses (90 ECTS) and a Master thesis combined with internship (30 ECTS) done in industry or professional R&D environment (about 5 months). Each student follows a joint programme, by combining different disciplines that can be studied at various universities.

Students start all together at ULIÈGE with the active support of scholars from SOLENT, UFRJ and UPM, and acquire core competencies in ship theory, design and production, and ship & offshore structures, but also soft skills as e.g. entrepreneurship.

The 1<sup>st</sup> year programme contains:

- Fundamental Lectures in Mechanical Engineering: Vibration, Finite Element Analysis (FEA), Materials, Optimisation, and soft skills as Management (30 ECTS);
- Ship theory, Integrated Project of Ship & Offshore structures, Ship Production... (30 ECTS);

Then students select a 2<sup>nd</sup> year track (ECN,URO,ZUT,UPM) according to the specialization they want to deepen (Fig. 1.2):

- Advanced lectures (30 ECTS) in one of the following universities:
  - Ship Technology & Ocean Engineering at URO with scholars from PNU, OSAKA and UNSW;
  - Hydrodynamics for Ocean Engineering at ECN with scholars from UoM and OSAKA;
  - Advanced Ship & Offshore Structures at ZUT with scholars from ITU and UGAL;
  - and soon Offshore Renewable Energy at UPM, with scholars from ICAM;
- Master Thesis & Internship (30 ECTS) with the support of:

- ICAM : *Composite Material and Offshore Wind Structure*
  - UGAL: *Advanced Hydrodynamics in Ship Design (Propulsion...)*
  - UNIGE : *Motor Yacht (Structural Design)*
  - SOLENT : *Small Crafts, Sailing Yachts & Racing Crafts*
  - UPM: *Offshore Wind Turbines and Marine Renewable Energy* (New partner)
  - SAB (Strategic Advisory Board) with industrial ... (see Annex A4: SAB and Annex A5: Internship),
  - UoM (USA), OU (Japan), UFRJ (Brazil), PNU (South Korea), UNSW (Australia), ITU (Turkey) and USTO (Algeria)
- Fig 1.4, where students may perform advanced master thesis, as a first step toward a PhD.

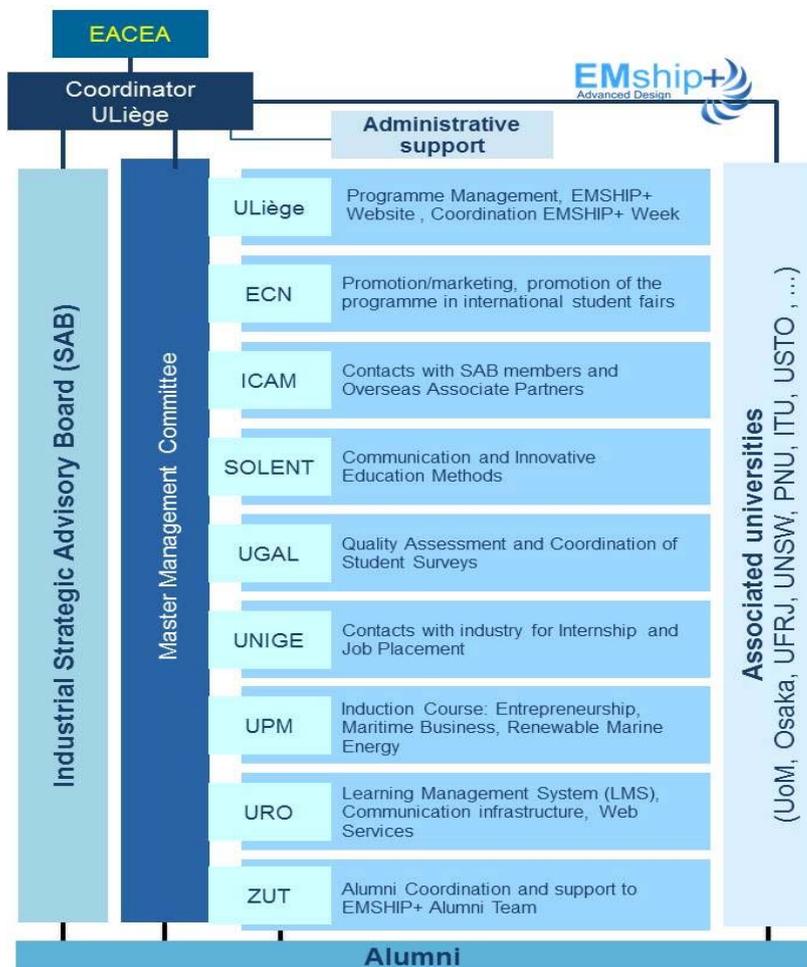
These tracks (Fig 1.2) are complementary and associated each with a double degree (joint degree with UPM). In each track, there is a specific educational field in which the partner excels and, as such, is recognized internationally. Throughout the coursework, each student can make his selection between these 3 (4 from Sept. 2020) alternative mobility tracks. He will have the opportunity to learn from composite material to yacht or offshore wind turbine design, from finite element to reliability analysis of offshore structures, from ship manoeuvrability to risk based inspection, and from ship propulsion to hull form optimisation).

After successful completion of his programme, he will be awarded by one of the following double/joint degrees:

- URO and ULiège;
- ZUT and ULiège;
- ECN and ULiège;
- UPM and ULiège (Joint degree).

A main innovation of EMSHIP<sup>+</sup> is delivering 3 double degrees (instead of one) and one joint degree (with UPM).

**a) EMSHIP<sup>+</sup> is based on a Common and Integrated Approach shared by the Consortium** (Fig 1.3, Table 3.3)



**Fig. 1.4: Partners and Associated universities**

**Fig. 1.3: EMSHIP<sup>+</sup>, a Joint and Integrated Master Program**

A shared and integrated programme has been developed and consolidated during the last 9 years between the partners and the associates of the Consortium (including industrials and Alumni). The experience gained throughout these years allows the new EMSHIP<sup>+</sup> to adequately allocate specific tasks to each partner and develop an integrated approach for both the management and the development of the education programme (see Fig 1.3 and Table 3.3). Based on this long experience, the Consortium has decided to welcome UPM and open a 4<sup>th</sup> track with a joint degree.

The EMSHIP<sup>+</sup> programme is based on integrated research and education initiatives, as well as administrative staff exchanges. The Consortium atmosphere of jointness/integration is reflected in every aspect of the new EMSHIP<sup>+</sup> programme: from visibility to postgraduate career prospects, going through selection, teaching, examination, marking, QA procedures, networking and, most outstandingly, awarding several double Master degrees.

Each partner of the Consortium has specific integration tasks, a specialization (advanced technology) and specific responsibilities (Annex B1: Partner Responsibilities). Specific partner responsibilities in relation with the joint organisation

are shown in Fig. 1.3 and Table 3.3.

The long lasting EMSHIP experience (2010-2018) is the supporting backbone to reach advanced and integrated approaches throughout the realisation and success of the EMSHIP<sup>+</sup> programme. We are extending jointness to all important aspects such as alumni organisation, dissemination and visibility, networking towards industrial and professional organisations, and employability, which are crucial within the EMJMD framework.

Thus, the resulting joint programme is consistent with the **needs analysis** (see Section 1.3), carried out by the EMSHIP<sup>+</sup> Consortium including the Alumni and the industrial SAB partners, in the *Design of Ships and Offshore Structures* field, and is fully aligned with the **EMJMD objectives**:

- To be involved in the necessary changes of our society in relation with global warming by proposing new alternatives in marine transportation and offshore structures dedicated to exploitation and use of oceans.
- To achieve postgraduate education of academic excellence in the field of “Advanced Design of Ships and Offshore Structures”, with solid conceptual foundations and innovative practical aspects as the basis of a multidisciplinary engineering approach, not available elsewhere in Europe.
- To enhance internationalisation of the European Higher Education Area (EHEA) by promoting worldwide its attractiveness to the best students and providing EU students with opportunities to follow a part of their programme abroad (USA, Japan, Korea, Brazil, Australia,...), see Fig. 1.4 and more information in Section 1.5.
- To promote professionalization, entrepreneurship and employability of postgraduates, as well as the social projections of careers in the field of the marine world (from designers to manufacturers, operators and regulatory institutions as International Maritime Organisation (IMO) and classifications societies). The Consortium wants to make the students deeply acquainted with the “World of Work”.

#### **b) Concrete elements of "Jointness" tailored and incorporated into the structure of EMSHIP<sup>+</sup> Master**

Jointly designed on the basis of common and integrated strategy, structure, practices and activities, the EMSHIP<sup>+</sup> programme relies on a variety of joint management bodies, procedures and practices, programme and activities; all of them recognised through the EMSHIP<sup>+</sup> Consortium Agreement (signed – see Annex E), the Student Agreement (Annex F) and in their further developments with the adequate updates.

Joint management bodies (Section 3.2.b and Annex B1: Shared responsibilities), which include the EMSHIP<sup>+</sup> management secretariat, the selection committee, the master thesis review team, the industrial SAB and the Master Management Committee (MMC) composed not only of academics but also of the representatives from students and Alumni. The MMC role is to harmonise administrative and academic matters related to visibility of the programme and global networking, students' selection, recruitment, progress assessment, examination, academic recognition (double/joint Master degrees), career prospects and quality assessment.

Joint procedures and practices (Sections 2.5 and 3.2.a, and Annex B1: Jointness), which include:

- the use of a common Intranet - “Learning management Systems (LMS)” – <https://lms.emship.org>, where are stored lecture materials, events, calendars and which includes integrated tools to access individual lectures and activities at each partner university (URO is responsible for its maintenance). Moreover, it is a joint management tool sharing also documents such as Student Agreement (template), MSc thesis progress reports and MSc thesis evaluation forms;
- a centralized website ([www.EMSHIP.eu](http://www.EMSHIP.eu)) keeping tracks of student's activities and giving room for Alumni information, job opportunities and Alumni positions. This website is sustained with harmonised procedures for promotion as well as for internal academic and administrative management at each partner university,
- a joint process of the online application (using our website) selection, admission, progress reports, complaints and appeals, provisory certificate before the formal diploma and finally Alumni affiliation,
- a joint definition of admission criteria and selection of candidates and joint allocation of students to keep a balance between partners and keep their involvement in the process,
- a mandatory mobility scheme (Fig. 2.3), including for instance a joint graduation ceremony and the annual EMSHIP<sup>+</sup> week, including the participation of two successive running cohorts (Section 1.4),
- the use of European standard grades (ECTS – Table 2.1) and the Consensus Mark Converter tool (<http://egracons.eu>) to recognise each other's grading systems for evaluating academic achievements and awarding the degree,
- a joint evaluation procedure: course grading, student assessment procedure of the Master (co-supervision), and joint jury at the end of each year to ensure the right decisions especially for students with academic difficulties,
- double or joint Master degrees and a joint diploma supplement, awarded by the Coordinating University – Annex D,
- joint Quality Assessment (QA) procedures (questionnaires, student assembly, etc.), supervised by the MMC, in combination with recognition of each other's regular QA procedures, as established in the Consortium Agreement (Annex E). Surveys are done anonymously using the intranet LMS,
- student agreement (Annex F) for the 2 years of study, approved by all partners (sent to the student after selection and signed by the student at arrival) and through the programme itself (well balanced between all the actors - Annex D4).

Joint programme scheme, competencies and skills: as described in the introduction, the programme combines disciplines in 4 different tracks, which are complementary. The full list of courses (Annex D4) and their associated learning outcomes, credits, assessment methods, and pre-requisites (Annex B4) are available on the EMSHIP<sup>+</sup> Intranet (LMS). The master thesis, integrated with an internship in industry, is undertaken during Semester 4 (30 ECTS). The theses are co-supervised by

different partners (including industrial partners). At the end, the theses will be assessed by at least 2 academic partners in addition to the industrial partner in charge of the internship. The master thesis is validated by the university in charge of the student during his 2<sup>nd</sup> year (according to a shared and unified procedure).

For motivated students, with excellent grades, EMSHIP<sup>+</sup> opens the way to a research career or to work in research/consultancy institutes (as HSVA) and Classification Societies (Annex A4: SAB). Currently, 4 former EMSHIP students already obtained a PhD and 7 are in the process. This is a major achievement and we want to do better.

EMSHIP<sup>+</sup> has been designed to provide graduates with **common and integrated competences**, transversal skills and learning outcomes identified by all the partners and recognised in the Consortium Agreement (Annex D4:Lecture Content).

Joint academic activities (courses, contests and graduation): students will have the opportunity to participate in student contests, for instance the DNV-GL Award for Young Professionals and the TRAVISIONS contest (<http://m120.emship.eu/misc/alumni-careers#5a>). Six former EMSHIP students have been awarded for outstanding ship designs (for examples: awards by the Worldwide Ferry Safety Association in 2017 and TRA VISION in 2018).

Twice during their studies, the students join the EMSHIP<sup>+</sup> week, where they meet professors from all the EMSHIP<sup>+</sup> partner universities, industrial members of the SAB, Alumni and students of the previous/next cohort. This is an opportunity for technical visits (shipyards, manufacturers...), discussions with industrial partners about internships and, for newly graduated students, about job opportunities. Those meetings help the students being acquainted with actors of the “world of work”. Graduated students present their master thesis (Annex A5) in front of this audience of professionals and students of the 1<sup>st</sup> year, who can learn from their colleagues’ experience. The next EMSHIP<sup>+</sup> week (Feb 2019) is organised in Hamburg by Becker (Engineering Company and SAB member), showing the **integration of the industrial world**.

### c) **“Jointness elements” for achieving the EMSHIP<sup>+</sup> EMJMD's objectives**

- Common procedures and helpdesk including individually tailored visa-related letters and documents, accommodation assistance, study plan, Student Agreement, FAQs document for preparatory procedures (Annex B1: Students’ Support).
- Joint selection board of Erasmus Mundus scholarship holders.
- EMSHIP<sup>+</sup> Consortium Grants for non EM scholarship holders, funded by OMCS (Panama), COTECMAR (Columbia) and from the Core Partner universities, for about 104 k€/year (Table 3.10).
- Implementation of priority joint QA actions: Student Agreement, external master thesis reviewer, deliberation rules, students' representatives at MMC meetings, update/harmonisation of Marks Converter Tool (Annexes B1 and F).
- Double degree delivery: EMSHIP<sup>+</sup> issues 3 different double Master degrees or 1 joint degree, and 1 joint diploma supplement, depending on the student’s mobility track (Annex B4: Mobility Planning);
- EMSHIP<sup>+</sup> Alumni establish connection tools for networking within the EMSHIP<sup>+</sup> community, such as Facebook user group ([www.facebook.com/groups/1104937472862574/](http://www.facebook.com/groups/1104937472862574/)) and LinkedIn EMSHIP<sup>+</sup> user group ([www.linkedin.com/groups/4227123/](http://www.linkedin.com/groups/4227123/)), maintained by the delegates of Alumni.

The Coordinating University stays in touch with several Alumni (as those who are PhD students in the Consortium universities), whom are asked to give their opinion to the Consortium about strategical decisions, or give advice to modify the content of the programme.

## 1.2 The proposal describes how EMSHIP<sup>+</sup> is integrated within the degree catalogues of partners and defines the degree(s) intended to be delivered, especially the award of an EMJMD joint degree

### a) **EMSHIP<sup>+</sup> is integrated within the accredited national degree catalogues of the HEIs partners from Programme Countries and these Master programmes are recognised**

EMSHIP<sup>+</sup> has been launched in Sept 2017, based on a Consortium Agreement (Annex E), 3 double Master degrees agreements (signed in 2016) and 4 accredited Master degrees (see below). Formally the 4<sup>th</sup> track (joint degree between UPM and ULiège, Fig 1.2) is not included in the proposal. The request for accreditation is being submitted early 2019 in Spain. The joint degree agreement between ULiège and UPM is already signed. As soon as the Spanish agency ANECA has confirmed the accreditation of the joint Master delivered, and under the condition of formal approval by EACEA, the joint degree will be delivered to the students choosing UPM as 2<sup>nd</sup> year University.

The 5 concerned universities fully recognise the EMSHIP<sup>+</sup> programme. :

- ULiège delivers the “*Master in Mechanical Engineering, specialized focus in “Advanced Ship Design” (Master Ingénieur civil mécanicien Ingénieur civil mécanicien à finalité spécialisée “Advanced Ship Design”)*”;
- ECN delivers the “*Master in Sciences, Technology, Health; specialized in Marine Technology” (Master en sciences, technologies, santé; mention technologie marine)*”;
- URO delivers the “*Master of Science in Ship Technology and Ocean Engineering” (Master of Science in Schiffs- und Meerestechnik)*”;
- ZUT delivers the “*Master of Science in Ocean Technology” (magister inżynier oceanotechniki)*”;
- UPM delivers the “*Master Degree on Marine Renewable Energies Harnessing (MAERM)*”, accredited at institutional level only so far.

The EMSHIP<sup>+</sup> programme has been integrated into each university’s catalogue and mutual recognition is assured by the double degrees/joint degree agreements. The 3 double Master degrees have approval at national level and are accredited by

laws and/or decrees (see Section 2.2.c). The demand of accreditation of the 4<sup>th</sup> degree (joint degree) has been asked to ANECA in early 2019 and the joint degree will be implemented only after formal approval of the EACEA.

#### **b) Type of degrees (joint/multiple/double degrees) provided to the EMSHIP<sup>+</sup> graduates.**

According to the mobility track chosen by the student, EMSHIP<sup>+</sup> will deliver double degrees (or joint degree with UPM). A joint Diploma Supplement drafted in English and delivered by the Coordinating University (ULiège) will gather information from the Consortium members and will be attached to the double degrees.

However, at the end of the programme, the students will receive a provisory joint certificate of success, drawn up in English, jointly signed by the Rector of the coordinating University (ULiège) and the other Universities' local coordinators. It will be completed by each degree delivering University's own certificate of success and transcripts of records for the whole program. Once the official diplomas are ready, they will be sent to the students with the joint Diploma Supplement. The aim of the Core Partners is to deliver only joint degrees before the end of the funding by EACEA.

#### **c) Steps towards accreditation of the EMJMD and EMSHIP<sup>+</sup> plan for issuing in the future joint degrees.**

Currently, EMSHIP<sup>+</sup> Master programme is accredited as such at institutional level by the 5 partners delivering accredited masters. Thanks to the evolution of the legislation related to the delivery of joint degrees in all the partner countries, it is possible today to deliver joint degrees in Belgium, Poland, Germany, France and Spain.

The Consortium has started the procedure for joint degrees between ULiège and ZUT, ULiège and ECN, ULiège and URO. The joint degree agreement between ULiège and UPM is already signed, while UPM has asked the Spanish agency ANECA for an accreditation of this joint degree. The ANECA's response is expected in autumn 2019. An amendment request will be submitted to EACEA as soon as a positive decision is received.

### **1.3 The EMSHIP<sup>+</sup> Master responds to clearly identified needs in the academic field.**

#### **Macro-need analysis:**

*At European level:* according to the European Commission ([https://ec.europa.eu/growth/sectors/mechanical-engineering\\_fr](https://ec.europa.eu/growth/sectors/mechanical-engineering_fr)), mechanical engineering industry is the industrial sector with one of the highest rate of recruitment in Europe. Its annual average growth rate is expected to reach 3.8% over the next 10 years. Obviously, the European industry is facing serious non-European competitors in terms of manufacturing capacities. This makes improved innovation and research vital to maintain European companies in the loop. The EMSHIP<sup>+</sup> Master Course aims at this goal, educating outstanding engineers who will mainly search for jobs in Europe after graduation.

*At international level:* in 2017, the International Labour Organization published their "Global Employment Trends for Youth" report (see link next line to copy in your browser) stating that:

[http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms\\_598675.pdf](http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_598675.pdf)

- A work experience acquired during the studies shortens the time between graduation and employment.
- Demand for medium skilled employees is decreasing, the need for high-skilled employees is rising and the demand for this type of labour force will increase in the following areas: science, engineering, technology and mathematics.
- The harsh competition between companies brings about a need for constant innovation. This will require from high-skilled employees ability to complex problem-solving, openness to learning and adaptability.

There is a growing demand at European and international levels of multidisciplinary Design Process for Ships and Offshore Structures. These challenges include the commercial vessels (very large container vessels of 25000 TEU), mega cruise vessels for more than 3000 passengers, sailing yachts (from racing yachts entering the Vendée Globe Race to mega yachts of 100m long), fast vessels, service vessels for offshore wind turbines (OWT) among others. Use of aluminium and/or composites materials, autonomous vehicles (including underwater vehicles and drones), offshore fixed structures for gas and oil, but also innovative floating OWT, **contribute to the 2030 and 2050 objectives of reducing greenhouse gas emissions by 80-95% by 2050**. This will only be possible with a 100% renewable energy power system in Europe by that date, with 50% of Europe's electricity provided by wind power. Wind power contributes to EU energy policy objectives (<https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2050-energy-strategy>): increased competitiveness, energy security and fight against climate change. This explains why the Master in Marine Renewable Energies of UPM will be added to the EMSHIP<sup>+</sup> programme (new track with a joint Master degree).

#### **a) The EMSHIP<sup>+</sup> Consortium have conducted Needs Analysis on which the proposal is built**

##### **EMSHIP<sup>+</sup> Need Analysis and Outcomes:**

In 2018(\*), an updated needs analysis was performed based on EMSHIP experience (2010-2018) and the feedback of Alumni, with the support of the stakeholders (industrial SAB). We also had the support of former EMSHIP graduates (Alumni), now PhD students, so that we could improve the management and content of the programme based on their experience.

(\*). Former needs analysis were performed in 2008-2009 and revised in 2014.

The key outcomes of the needs analysis were that:

- We needed to move to a 120 ECTS Master (M120) instead of a 90 ECTS Master (M90): the M90, as it was organised, could not continue because ECN would have had to quit the programme, due to courses schedule constraints. Thus, considering the fact that the former EMSHIP was successful for the last intakes (>25 students/years) and sustainable (>50% of self-funded in the last 3 intakes, see Annex A2: Employability), but also that the Consortium targeted a high quality education program and wished to **increase the Master attractiveness** by widening the range of students that may apply, the EMSHIP<sup>+</sup> Consortium decided to organise a new European joint master, based on the same Consortium,

enriched with a few new members, **accessible to students having a bachelor degree (180 ECTS) instead of a Master degree (300 ECTS).**

- Moving from the M90 to M120 program, more EMSHIP<sup>+</sup> graduates will have the relevant profile for jobs in high-tech companies and R&D institutes (in Europe but also worldwide), in other words **a broader employability**. Our target is that the graduated students will get a job within 3 months after their graduation (or even faster, which is the standard in the Consortium universities, where students often get job before graduation).
- During one of the EMSHIP weeks, the industrial stakeholders raised the importance to tackle not only ships but also **offshore structures (including wind energy structures)**. For that reason, from 2019 UPM joins the Consortium proposing its expertise on offshore wind energy (based on his MAERM master). In addition, since 2015, some lectures at ULiège, URO and ZUT had been updated to also target “Design of Offshore Structures”.
- The Consortium must keep the program close to the professionals’ and industrials’ interests, and particularly proposing a long-term internship coupled to master thesis (5 months in total) to **optimize this first professional experience** and inserting them early into the world of work, guarantee a good rate of employability after graduation.
- Increase the possibility for outstanding students to be well prepared to start a PhD after EMSHIP<sup>+</sup>, by promoting internships and master thesis in **research institutes or advanced laboratories**.
- **Extend the EMSHIP<sup>+</sup> network** in Europe and worldwide (new partners and Alumni).

Based on these need analyses, in 2015 the consortium started planning the EMSHIP<sup>+</sup> programme, launched in Sept. 2017.

#### Identification of expected profiles:

In addition to the academic knowledge linked to “Advanced Design of Ships and Offshore Structures”, EMSHIP<sup>+</sup> has identified the need to deliver a variety of skills to form internationally oriented and open minded engineers, having the ability to perform critical analysis, with multidisciplinary and transversal competences and soft skills such as languages, project management, entrepreneurship and opening to multiculturalism.

#### Academic needs and opportunities:

The internationalisation opportunities offered by EMSHIP<sup>+</sup> are rather unique, with renowned international partners as Osaka Univ. in Japan, UFRJ in Brazil, NSWU in Australia, PNU in South Korea and UoM in USA.

In addition, EMSHIP<sup>+</sup> provides internships and job opportunities throughout Europe (high level of employability). Current industrial partners supporting EMSHIP<sup>+</sup> are from France, Belgium, UK, the Netherlands, Germany, Poland, Scandinavia, Romania, Italy, Spain and Greece, but also from Panama, Brazil, South-Korea and recently Turkey.

It is important that students learn different ways of teaching (from standard lectures to research-informed teaching and interdisciplinary pedagogy), learning languages and developing communications skills. EMSHIP<sup>+</sup> is unique on these aspects, which are very important for employability.

Moreover, the implementation of the lecture capture technology with micro-lectures including embedded quizzes has been tested and approved by students. So, the Consortium has decided that students will have access to all recordings (online) to catch up with lectures, revise for exams and deepen their knowledge in an engaging way (info in Section 2.1.b).

### **b) Based on the needs analysis results (at national/international level), what does EMSHIP<sup>+</sup> offer as added value?**

#### **Added value for the students**

→ Career prospects: successful completion of this programme will prepare the students for a **leadership and entrepreneurship** role in various naval and ocean engineering sectors. European and worldwide employers active in these sectors require top quality graduates as managers, planners, researchers, designers or advisors, who can make the “difference” in the design of ships and offshore structures. They need people who have the ability to think through complex issues, who can analyse the structures through various modelling approaches, who are capable of managing projects and programmes, and have well developed leadership and personal skills.

EMSHIP<sup>+</sup> Consortium supports **career development since the very first day after the student enrolment**. A career’s perspective is delivered once registration has been formalized and remains available online, in the EMSHIP<sup>+</sup> Consortium website. The prospect contains: guidelines, links and references to orientate the students about potential careers; interesting links for job seeking and published job offers, to let them know which are the requisites and conditions for different employment opportunities. This career prospect is regularly updated, together with the website. Additionally, ULiège organises a training session in English to give them an **introduction on how to draft a CV and prepare for a job interview**. Seminars about spin-off creation and entrepreneurship are also available (as complementary credits).

→ Job opportunities: each local supervisor will advise students on potential careers and opportunities. EU Marine institutions (such as WEGEMT) have been committed to contribute to the dissemination and visibility of the EMSHIP<sup>+</sup> MSc achievements to the professional sector/associations, as well as to maintain the EMSHIP<sup>+</sup> Consortium informed about opportunities in their sectors. They recognise that the learning outcomes of the EMSHIP<sup>+</sup> programme are suitable for position in their institutions/companies. Likewise, associated industrial partners (SAB) are willing to hire our outstanding students, e.g. 2 alumni at HSVA (Germany) and 7 alumni at Bureau Veritas among others.

#### **Added value for the Consortium universities and partners**

- To recruit outstanding candidates after their BSc or BEng (instead of after Master)

*Added value: we have launched the EMSHIP<sup>+</sup> Master with 8 self-funded students in Sept 2017 and 15 in Sept 2018;*

- To keep close contact to the professionals through a long-term internship coupled to master thesis,  
*Added value: student's internship is a huge opportunity for students to gain a first experience of work in industry.*
- To increase the possibility for best students to start a PhD thesis,  
*Added value: more outstanding students will have the possibility to do internship in research department on advanced topics, which may be continued during PhD or Research Engineer positions.*
- To increase the employability rate after 3-6 months (currently we reach 95-98% after 12 months – see Annex A2)  
*Added value: the M120 Master fits better European demands as we will be able to work on the “student background”, before teaching specific advanced topics in relation with the Design of Ships and Offshore Structures. Having 3 (and later 4) tracks of 60 ECTS in parallel instead of 5 tracks of 10 ECTS (with the previous program) will allow going for more advanced specialisations, closer to industries' needs.*
- Proposing more diversity for internships/master thesis (more than 15 potential specialisations instead of 5 with M90).  
*Added value: increase diversity and internationalisation in the Consortium universities.*
- To reach a better gender balance, as the new programme looks more attractive to both genders.  
*Added value: in Sept. 2017 we had 37% of women and 33% in Sept 2018. Even if this good ratio must be confirmed, the potential of M120 to reach a balance between genders is higher (Annex A1: Statistics).*

**Added value for the industrials and stakeholders:** to reinforce the competitiveness of EU companies by increasing their activity of R&D and increase the potential of non EU countries to develop their marine industry (design, shipyard...).

**Added value for the society:** develop green transportation (environment) and marine renewable energies (ocean/wind) to encourage the evolution of the society to an ecological transition; develop integrated and multimodal transportation (energy savings); reinforcement of local economy (jobs) and reply to industries' needs (competitiveness).

### c) Justifications of EU financial support to EMSHIP<sup>+</sup>

The EMSHIP<sup>+</sup> student participation requested to EU will be 8.5 k€/year for Non-EU students and 4.5 k€/year for EU students (including full health insurance). This EU financial support is needed to cover the expenses required to perform the EMSHIP<sup>+</sup> educational and transversal activities and make the Master sustainable after the funded period. These amounts are justified in Section 3.4.a (Tables 3.7 and 3.8) and the reasons why additional financial support is necessary after the previous EMJMD project are extensively listed in Section 4.1.a.

EMSHIP<sup>+</sup> must be considered as a **new proposal in terms of attraction and sustainability:**

- EMSHIP<sup>+</sup> targets other types of students, younger candidates, with other backgrounds and objectives. The programme has to redevelop its reputation from scratch to attract high quality level self-funded students.
- The EMSHIP<sup>+</sup> students are younger; candidates are at bachelor level. So it is more difficult for them to be self-funded, compared to EMSHIP M90 candidates who had often worked during 2-3 years before joining the programme. So the support of EACEA is required at the launching of the EMSHIP<sup>+</sup> Master to reach sustainability after 4 or 5 years.

**In conclusion the reasons for funding EMSHIP<sup>+</sup> are:**

- The need for highly qualified engineers in Europe.
- The need to increase the education level in many countries worldwide (India, Africa, Middle East ...), improving the local economic development of these countries, and expecting future collaboration with Europe thanks to privileged links created during applicant's education in Europe.
- The need to support the competitiveness of the marine industry in Europe (ship industry and also emerging wind industry) by providing highly qualified engineers with more transversal skills and open-minded to the world market.
- The Erasmus Mundus support goes much beyond direct financial support. By being recognised with the Erasmus<sup>+</sup> brand (catalogue), the EMSHIP<sup>+</sup> will gain attractiveness for potential self-funded students (\*), which increases the budget by participation costs, and visibility for potential sponsors and potential employers. Moreover the brand is recognised within home institutions of the Consortium as an added value, to allocate additional budgets, to be considered as priority actions or to be better recognised in local and national calls for funding.

(\*). Annex A1 “Student Statics” shows that the former EMSHIP attracted many self-funded students (about 15-20 each year), owing to the Erasmus<sup>+</sup> label (and catalogue).

## **1.4 EMSHIP<sup>+</sup> aims to increase the attractiveness of the European Higher Education Area (EHEA), and to foster excellence, innovation and competitiveness in terms of academic fields/subjects targeted.**

EMSHIP<sup>+</sup> is built to form graduates with multidisciplinary profiles in a fully integrated world class EU MSc programme, developing the student's critical understanding of technical and scientific tools, together with excellent management abilities and personal skills, achieving high academic standards. These capabilities are supported by recognised quality assurance (QA) procedures, promoting staff exchange and students' mobility under an ECTS scheme.

### a) EMSHIP<sup>+</sup> main academic subjects and their relevance for the academic disciplines/fields

The academic expertise of the different EMSHIP<sup>+</sup> partners is listed in Section 1.1 and in Annex D4: Course Content. Starting from the expertise in integrated approaches to design ships and offshore structures, the long-lasting experience of the Consortium Partners and their Associates relies on research and teaching activities carried out at global scale, including the majority of the design challenges (or specializations).

Within this unique and integrated programme, EMSHIP<sup>+</sup> offers the students the opportunity to tackle several of these

challenges. During the 1<sup>st</sup> year the students discover attractive topics of which they were not aware. Doing so, they have the opportunity to select their 2<sup>nd</sup> year and then their internship and master thesis which will give them some perspectives they never imagined when they registered to the EMSHIP<sup>+</sup> course.

EMSHIP<sup>+</sup> relies on the international academic partners (Section 1.1 – Fig. 1.4). Through these overseas partners, but also Industrial SAB partners, EMSHIP<sup>+</sup> offers good job opportunities to students and a wide range of diversifications (design offices, classification societies, shipyards, ship-owners, PhDs and academic carriers ...). As EMSHIP<sup>+</sup> is based on an excellent background in Mechanical Engineering (obtained by the students during their BSc/BEng and completed during the 1<sup>st</sup> semester at ULiège) and also due to the transversal competencies acquired during the programme, the graduates may also open gates to jobs in closely related fields: car industry, aerospace and other mechanical engineering fields.

To our knowledge, many other European Master programmes in this field cannot cover the whole range of specializations in the manner EMSHIP<sup>+</sup> does. From the recent past experience, we had students asking for master thesis in very specific topics (such as WIG flying ships or risk based management): thanks to our extended network we found support from UNSW (EMSHIP<sup>+</sup> partner in Australia) and Lloyds Register (SAB member) to satisfy these students.

The EMSHIP<sup>+</sup> partners combine their excellence in specific fields so that they create all together a Consortium providing much more specializations, more cultural diversity, and an extended professional network, in one word **more “internationalization”**. EMSHIP<sup>+</sup> provides high chances to get a job, and in most cases the job the student is dreaming of, as designing a mega yacht or building a floating offshore wind farm.

Moreover, the EMSHIP<sup>+</sup> programme is designed to confer the students a unique **transversal and integrated engineering knowledge**, not available elsewhere in Europe. Accordingly, the students receive advanced multidisciplinary courses (hydrodynamics, non-linear finite element analysis, material engineering, assembly technology, design and optimisation technology,...) and many transversal engineering skills (risk analysis, rules & safety, life cycle management). In conclusion, the structure of EMSHIP<sup>+</sup> education programme and its flexibility give the student the opportunity to develop his own curriculum. As such, the EMSHIP<sup>+</sup> EMJMD enhances graduates' competitiveness and is very attractive for future designers of innovative marine vehicles and offshore structures within a European and worldwide context.

The EMSHIP<sup>+</sup> programme has been thought and built as a high quality education based on an internationally recognised strong research activity of Consortium partners (see “*Skills & Expertise of the EMSHIP<sup>+</sup> Staff*”, pages 46-54).

The Consortium partners are involved in many European projects and are members of EU and international associations showing their high level of expertise and their relevance towards EU policy. Examples of partnerships and projects are:

- ITTC (Int. Towing Tank Conference), ISSC (Int. Ship and Offshore Congress), EERA JP WIND;
- Editorial Board Members of journals: Ocean Engineering, .... and journals such as: JMST (Japan), Marine Structures (Elsevier), Ship Technology Research (Germany), ...;
- EU Waterborne Platform ([www.waterborne.eu](http://www.waterborne.eu)); and EU projects: HOLISHIP (Holistic concept of ship and offshore structure optimisation), JOULES, BESTT, VIRTUE, PROMARC, VISIONS, MaRINET2...

#### **b) EMSHIP<sup>+</sup> enhances the competitiveness of the targeted academic disciplines.**

EMSHIP<sup>+</sup> supports the EU competitiveness as a large part of the EMSHIP<sup>+</sup> educational programme fits the needs related to ships & offshore units designed and built in Europe. For instance, 95% of the worldwide large cruise vessels (ships for > 2000 passengers) are built in Europe by 3 major shipyards: Meyerwerft (Germany and Finland), Chantiers de l’Atlantique (France) and Fincantieri (Italy). Similarly, the EU is leading the ocean wind energy market (2/3 of world projects) and EMSHIP<sup>+</sup> will train well educated engineers for EU companies such as EDF, ENGIE, ØRSTED, EQUINOR, SIEMENS, GAMESA, SENER, IBERDROLA, etc. An opportunity is available to Programme and Partner country students to gain knowledge about the extensive R&D done in Europe.

Moreover, EMSHIP<sup>+</sup> gives the students the opportunity to become familiar with EU advanced technologies used during the R&D phase of the development (design) of new products (ships and offshore structures).

#### **c) Learning outcomes of the EMSHIP<sup>+</sup> programme**

EMSHIP<sup>+</sup> is designed to be a multidisciplinary Master. So, graduates may expect to continue their education with a PhD programme (about 30%) and the others (70%) may target a promising career in the industry. In view of the needs analysis and future career prospects (Annexes A2 and A3: Employability), **the learning outcomes** prepare students to undertake an integrated and multidisciplinary career, including interactions with renewable energy, deep-sea mining, fisheries, water treatment, and waterborne transport.

The future EMSHIP<sup>+</sup> graduates will be able to join multidisciplinary teams, with expertise in a given NAOE discipline or at the overlap with other disciplines, such as aquaculture, deep sea mining, dredging, and oceanography. Students will be able to communicate with marine scientists and specialists of diverse fields, facilitating communication between team-workers (e.g. with ship owners and International Maritime Organisation (IMO) inspectors) and promoting mutual understanding. They must be able to accomplish transversal research (from sloshing modelling to ultimate strength; from propulsion to environmental friendly hull coating selection).

The general learning outcomes are summarised below. More details on specific competences and skills, corresponding to the diverse components of the coursework and research, are given in Annex D4: Course Content.

**Competences:** After successful completion of the EMSHIP<sup>+</sup> Master, the students will be able to demonstrate knowledge, understanding and competences of a wide range of topics, such as:

- Designing ships and offshore structures; from standard vessels to innovative autonomous or underwater vehicles.
- Advise a ship operator to optimise the use of its fleet (fleet management);
- Develop new rules (classification societies, IMO...) to guaranty the safety of the structures (ships, floating offshore wind turbines) and the staff (mariners and operators), to protect the marine environment (air and sea) against pollution, noise, keeping the ocean resources available for the next generations;
- Building marine structures (from panel line to block assembly and finally the dry dock or launching facility);
- Design and build ship equipment such as propellers, engines, ballast tanks, cranes...;
- Design, installation and maintenance of marine renewable energy farms, especially for offshore wind farms, including economic and planning aspects;
- Perform experimental and numerical modelling required for the design of ships and offshore structures, such as:
  - o Assess extreme loads inducing failures of marine structures (wave impact, sloshing, ultimate bending moment);
  - o Assess stress and strain in a structure using non-linear finite element methods;
  - o Study the drag, seakeeping and manoeuvrability of a ship using CFD codes;
  - o Assess the vibration and the risk of cracks induced by cycling loads (fatigue) in a structure;
  - o Design and optimise hull form, propeller and rudder; and assess the required propulsion power to select engines.
- Management of a project, including the maritime rules from IMO, SOLAS...
- Be familiar with new emerging concepts in design rules and codes: reliability, risk, big data, design for "X"...

**Specific skills:** EMSHIP<sup>+</sup> students will be able to put into practice the following specific skills:

- Critically analyse, synthesise, interpret and summarise complex scientific processes;
- Recognise and use theories, paradigms, concepts and principles, to design and undertake primary R&D within the context of multidisciplinary Design Process for Ships and Offshore Structures (including Offshore Wind Energy);
- Collect, record, and analyse maritime environmental data (wind, wave...) and structural data (monitoring);
- Read, use and refer to the ships and offshore structures designed by others, in an appropriate manner.

**General and transferable skills:** the EMSHIP<sup>+</sup> students will possess general and transferable skills such as:

- Use and develop design skills, extendable in car and aerospace industry (as autonomous vehicles);
- Soft skills: use of English and some other European languages, intercultural awareness, open-mindedness, management principles, research methodology, basic entrepreneurial knowledge;
- Prepare, process and present data, using appropriate qualitative/quantitative techniques and computer software packages, and solve complex numerical problems ;
- Undertake field and laboratory investigations in a responsible and safe manner, paying attention to risk assessment, access rights (patents), relevant health and safety regulations and sensitivity to the impact of investigations, on the environment and the stakeholders;
- Apply knowledge to address familiar and unfamiliar problems. Design, implement and report on scientific research projects, including major research projects at the forefront of ships and offshore structures knowledge;
- Critical use of the Internet as a mean of communication, data dissemination (for scientific and R&D purpose);
- Evaluation of performance as an individual, as a team member (ability of team working) and as team leader;
- Continue to develop the skills necessary for self-managed and life-long learning.

#### d) What is new, unique and innovative in EMSHIP<sup>+</sup> compared to similar academic offers?

The proposed EMSHIP<sup>+</sup> EMJMD is **unique** because its conceptual framework embraces a multidisciplinary design process for ships and offshore structures (as the basis for its academic foundation). What makes EMSHIP<sup>+</sup> unique and **more innovative** compared to similar Master is that EMSHIP<sup>+</sup> is **industry driven** and is strongly **open to diversity** (Table 1.4).

**Table 1.4: Comparison between EMSHIP<sup>+</sup> and similar EU Programmes**

Criteria	EMSHIP <sup>+</sup> (compared to other similar EU programmes)
<b>1- CURSUS</b> <ul style="list-style-type: none"> <li>o <b>Diversification: availability of specialisations</b></li> <li>o <b>Quality of the lectures</b></li> <li>o <b>Quality of the facilities</b></li> </ul>	<b>1- CURSUS</b> ++ EMSHIP <sup>+</sup> is much more diversified = Identical in average = Identical in average
<b>2- LONG HISTORY and REPUTATION</b> <ul style="list-style-type: none"> <li>o <b>Is it well known (long history)?</b></li> <li>o <b>Reputation</b></li> </ul>	<b>2- LONG HISTORY and REPUTATION</b> - EMSHIP <sup>+</sup> is not the most well known in EU = Excellent reputation due to strong partnership
<b>3- OPPORTUNITIES</b> <ul style="list-style-type: none"> <li>o <b>Internationalisation</b></li> <li>o <b>Mobility (in EU and worldwide)</b></li> <li>o <b>Soft Skills &amp; Culture</b></li> <li>o <b>Contact with the World of Work (Industry)</b></li> <li>o <b>Internship</b></li> <li>o <b>Employability (job)</b></li> <li>o <b>Cost of education</b></li> </ul>	<b>1- OPPORTUNITIES</b> ++ EMSHIP <sup>+</sup> is much more diversified ++ EMSHIP <sup>+</sup> includes 3 mobilities and 3 cultures + Multicultural programme through the mobilities ++ Much more opportunities + Long internship in real industrial environment + More opportunities for non EU students = Identical in average, for self-funded

Tentative of similar joint EU Masters have been undertaken in EU, such as the Nordic Master in Maritime Engineering ([www.nor-mar-eng.org](http://www.nor-mar-eng.org)) and the Master between TUHH (Hamburg) and Strathclyde (UK) - [www.strath.ac.uk/courses/postgraduate/taught/shipoffshoretechnology](http://www.strath.ac.uk/courses/postgraduate/taught/shipoffshoretechnology)). They are competitors, but they differ drastically from what EMSHIP<sup>+</sup> proposes (Table 1.4). They are well established and offer a high quality education but they are usually very much focused on a pure narrowed “Naval Architecture” field and do not provide the cross-boundary competences and transversal skills offered by EMSHIP<sup>+</sup>, neither such a large opportunity of internationalisation, and often not such extended contacts with industry.

The key points making the difference are:

- EMSHIP<sup>+</sup> is deeper industry driven and better adjusted to the needs of the industry;
- EMSHIP<sup>+</sup> proposes a wider variety of specializations than other programs (Section 1.4-a);
- EMSHIP<sup>+</sup> provides a very high level of internationalisation (Sections 1.5 and 4.2);
- EMSHIP<sup>+</sup> pays attention to social and cultural integration (Section 2.6).

**EMSHIP<sup>+</sup> is industry driven** (*to be acquainted to the world of work*): from the very beginning, the EMSHIP<sup>+</sup> Consortium had identified the need and strong potential for associating employers from the maritime industry to the master. Therefore, an **Industrial Strategic Advisory Board** (SAB – Annex A4) was established with more than 25 companies from different European countries. EMSHIP<sup>+</sup> aims at including their active participation and benefiting from their expertise all around the year, e.g. with seminars (Bureau Veritas, Abeking Shipyard.....). Annually, during the EMSHIP<sup>+</sup> week, the SAB industrial group advises the EMSHIP<sup>+</sup> MMC about their assessment of the programme (lecture contents) and may recommend updates.

To guaranty this industry driven commitment, each student must perform an internship (coupled with master thesis) during 5 months in industry (R&D environment for those targeting a PhD). After 9 years of experience with former EMSHIP, we know that performing a long industrial internship is the key selling point for more than 50% of the students, when they decide to join EMSHIP<sup>+</sup> and not another programme.

Another point of concern is **the student mobility**. Non-EU students are very much attracted by the opportunity of studying in different institutions (3 countries, 3 languages and 3 cultures).

The **EMSHIP<sup>+</sup> week** is annually organised with students (1<sup>st</sup> and 2<sup>nd</sup> year students), professors and industrial partners (15-20). During this event, the most important moment is the **job fair** with the **industrial partners**, members of the SAB and university partners who propose internships and master thesis to students. SAB members present their activities and business objectives and are invited to attend the **presentations of the master thesis** by the new graduated students. Usually one workshop (typically one EU H2020 research project as JOULES or HOLISHIP) is also proposed. The graduation ceremony for students ending their 2<sup>nd</sup> year closes the EMSHIP<sup>+</sup> week.

**The EMSHIP<sup>+</sup> weeks are usually the 1<sup>st</sup> contacts for the students with industrial companies**, which will bloom into final professional placements (internships and later jobs).

The organisation and location of the EMSHIP<sup>+</sup> week is handled every year by a different Consortium member, proving there their joint commitment. This event is of course endorsed by Alumni, associated and industrial partners. By this mean, a **permanent interface with industry** has been created, allowing to regularly discuss about the EMSHIP<sup>+</sup> educational programme with respect to its structure and education fields, to communicate about the EMSHIP<sup>+</sup> programme into the professional sector, to make companies offer lectures, workshops, internships, scholarships and also job opportunities.

EMSHIP<sup>+</sup> also **encourages students to do internships during the summer** between 1<sup>st</sup> and 2<sup>nd</sup> year, to have a 1<sup>st</sup> contact with the professional world (and an additional mobility), as EMSHIP<sup>+</sup> industrial partners also provide traineeships.

EMSHIP<sup>+</sup> **supports students to join international contests** (voluntary based). This gives students more work, but also a high motivation and it gives them an insight on **entrepreneurship**. This also pushes them to identify industry’s needs and propose innovative concept adjusted to industry’s expectations. That also shows their ability to **communicate/disseminate** their ideas (challenging for non-native English speakers). The success rate of the EMSHIP students is impressive, considering that usually the contest concerns *innovative ship design or offshore structure concept* (see <http://m120.emship.eu/misc/alumni-careers>).

→**Social network for students** is promoted and supported by the EMSHIP<sup>+</sup> MMC by maintaining discussion groups within LinkedIn, Facebook and WhatsApp. The EMSHIP/EMSHIP<sup>+</sup> Alumni group (managed by former students themselves) is active keeping contacts between the graduates. They organise meetings in various places in Europe, based on opportunities such as conferences, EMSHIP<sup>+</sup> weeks, or simply sharing some vacations. The EMSHIP/EMSHIP<sup>+</sup> Alumni group also participates actively in the **EM Alumni Association** (EMA).

→**Social and cultural integration** is also pursued: many students stay in the same residences and events such as welcome days (at each teaching location), New Year lunch (where the students bring their own typical food, shared altogether), graduation ceremony... are organised.

#### e) **EMSHIP<sup>+</sup> contributes to university excellence in the European Higher Education Area (EHEA)**

EMSHIP<sup>+</sup> follows the guidelines of the Bologna process and accompanying actions. **Student-centred learning** is pursued, since the very beginning. Each student is offered an individually-tailored programme, including coursework, research and mobility-schedule; this is agreed before registration and is recognised in the Student Agreement.

The high staff-student ratios and the excellence of the laboratory facilities (as towing tank, offshore tank and structural

labs) and research-active staff (see Skills & Expertise) are favourable conditions for this purpose ([www.eua.be/activities-services/institutional-evaluation-programme/who-has-participated/iep-evaluation-reports.aspx](http://www.eua.be/activities-services/institutional-evaluation-programme/who-has-participated/iep-evaluation-reports.aspx))

**f) As EMSHIP<sup>+</sup> is based on a previously funded programme, it will spread the benefits of this previous master in a wider European context (via new partners).**

Compared to the former programme, the EMSHIP<sup>+</sup> Master targets similar technical issues but not similar candidates as the targeted students have quite different backgrounds. Nevertheless the experience gained and the developed network from the former programme will be useful to spread the new programme to a wider EU community.

As the BSc candidates have a shorter experience and reduced background compared to former candidates starting with a Master degree, a new semester (30 ECTS) dedicated to the Fundamentals in Mechanical Engineering has been added and the program moved to a 120 ECTS Master (standard in Europe). These 30 new ECTS (solid mechanics, finite element method, vibration, CAD, materials...) constitute the mandatory background of any naval architect, marine and offshore engineer. These fundamentals are also required for the advanced lectures (such as numerical modelling in ships and offshore structures, hydrodynamics). These advanced lectures are indeed requested to get a job in R&D dept. of European companies (ship, offshore, wind energy...), but also worldwide (Australia, Brazil, Japan, Korea, USA...).

Compared to former EMSHIP, the new Consortium welcomes 3 new partners:

- **UPM** (Spain), not involved in former programme, has been selected for its experience in renewable energy and specifically for their **offshore wind structures** expertise and will implement soon the joint degree with ULiège.
- **SOLENT** (UK) joins the Consortium to widen the diversity, providing an attractive opportunity of education in **small crafts and sailing yachts** (in complement of UNIGE focussing on large motor yachts).
- **ICAM** (France) has a strong expertise in composite structures and industrial link with the **offshore wind energy**.

**ICAM** and **SOLENT** are deeply industry oriented and are perfectly complementary with the advanced programmes delivered by ECN, URO, ZUT and UPM. They both will welcome students for master thesis and supervise internships with their industrial partners.

Another major change is the role endorsed by **URO** and **ZUT**. They took the opportunity of the additional semester to take a more active role as they decided to join ULiège and ECN and deliver a double-degree (and soon a joint degree).

**In conclusion, the benefits of the EMSHIP<sup>+</sup> programme** come from a series of changes and innovations, which are:

- **30 additional ECTS;**
- **new partners;**
- **to allow students to secure a high scientific background to go faster and deeper in advanced technologies;**
- **better prepares students to fit EU and worldwide industry needs and associated high standards (Section 1.3);**
- **double/joint Master degrees, fully recognised as “EU Engineering Master Degree”, which gives access to the profession, easy for equivalence in all the EU countries and worldwide;**
- **large range of diversified programs as the candidates can choose between 3 (soon 4) Master tracks;**
- **being more attractive to EU students, as they can join directly after BSc or BEng;**
- **to support the EU Policy with a long-term goal of reducing greenhouse gas emissions by 80-95%,**  
<https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2050-energy-strategy>

We are convinced that typical former M90 applicants, having high expectations in terms of job, will also be attracted by the new EMSHIP<sup>+</sup> program, which will increase their chance to get a job in Europe but also overseas. This has been demonstrated during the first recruitment period (Jan 2017) as we were simultaneously recruiting students for M90 and M120. They had the opportunity to select M90, M120 or both, and >75% applied for the new M120 Master (or both).

**g) EMSHIP<sup>+</sup> anticipated results strengthens innovation and excellence in the HEIs involved, and strengthens the European higher education system in general vis-à-vis other regions and competitors in the education field.**

EMSHIP<sup>+</sup> is strengthening innovation and excellence at wide scale because it:

- is industry driven and is aware about industry's needs for innovation and excellence.
- is able to update lecture contents quickly to fit students and industrial needs. In the past, we already added/updated lectures according to industrial partner advices; for instance 1) Maritime business, Maritime rules and regulations (IMO...); 2) Offshore engineering; 3) Composite materials (implemented by ICAM); and 4) Marine renewable energies (offshore wind energy), but also in entrepreneurship (UPM).
- has outstanding facilities as large wave basin at ECN, towing tanks (ECN, ULiège, SOLENT, UNIGE, UGAL,...), structural labs (ULiège, ICAM, URO, SOLENT), fire testing (ULiège), wind tunnel (ECN, ULiège), which are accessible to students during dedicated lab works and their master thesis.
- is acknowledged by our industrial partners as the best European education program in the concerned field to educate foreign students and later to hire them. They are convinced that being on the edge of the development (innovation and excellence) is the only way to keep and further develop their leadership.
- helps industrial partners strengthening innovation and excellence in their sector.
- is a secure education, based on excellence, which is more efficient than many other HEISs in this field.

EMSHIP<sup>+</sup> partners collaborate with many scientific associations such as WEGEMT, ISSC, ITTC, EERA and many H2020 R&D projects (JOULES, HOLISHIP), sharing educational expertise and R&D opportunities, in which the EMSHIP<sup>+</sup> staff

and students can be involved and transfer technologies to strengthen innovation and excellence to HEIs not involved in EMSHIP<sup>+</sup>.

#### **h) EMSHIP<sup>+</sup> contributes to increase the attractiveness and competitiveness of the EHEA**

The EMSHIP<sup>+</sup> programme is attractive for students looking for university excellence, innovation and competitiveness. This is clearly manifested in the “*objectives and activities*” of the involved universities (see Section 3.1 and “*Skills and Expertise*” of the EMSHIP<sup>+</sup> staff, pp. 46-54). For instance, **ECN** is a leading university in hydrodynamics for ships, offshore structures and marine renewable energy converters through experimental (at model or full scale) methods or numerical simulation; **URO** in ship design methods, CFD, maritime structures and ultimate strength assessment; **ZUT** in structural design, structural mechanics and production technology, **ULiège** in inland navigation, crashworthiness, structure optimisation and offshore structures; and **UPM** in renewable marine energy and specifically in offshore wind energy.

Many non-EU and EU students are attracted by the EMSHIP<sup>+</sup> programme because of the integration of university excellence into a well-structured and ambitious EMJMD programme. As explained before (Section 1.3), EMSHIP<sup>+</sup> provides a unique attractiveness by the broader scope, the diversity of education, the mobility and the multicultural program, compared to the programs delivered worldwide in the field of NAOE. EMSHIP<sup>+</sup> concentrates in a single programme much more opportunities than any of these programmes. This increases definitely the attractiveness and competitiveness of the EHEA. In addition, EMSHIP<sup>+</sup> will reinforce the attractiveness of the EHEA through the following elements:

- Erasmus<sup>+</sup> scholarships attract the best students from Partner Countries;
- Mobility of students enables to get training in most outstanding R&D aspects of the multidisciplinary approaches in *Advanced Design for Ships and Offshore Structures*, at regional, national and international scales;
- EMSHIP<sup>+</sup> network of universities and graduates act as ambassadors to attract new students from their home countries (supporting the EMSHIP<sup>+</sup> Consortium with tools such as e.g. the Alumni Facebook...);
- Integration of the extended EMSHIP<sup>+</sup> Consortium [4 Core Partners, 5 EU partners, 8 non-EU associated organisations and more than 25 industry partners (SAB)] through staff exchange, student internships and master thesis placements. This includes Erasmus<sup>+</sup> scholarships that are highly valuable to attract outstanding scientists/professors into the EMSHIP<sup>+</sup> Consortium community. Several of the associated partners, which joined the EMSHIP<sup>+</sup> Consortium, are the result of actions taken by EMSHIP scholars in their home institutions; e.g. ITU (Turkey), PNU (Korea), UFRJ (Brazil), SOLENT (UK), ICAM (France), which were not part of the Consortium in 2010;
- Outreach and social projection, including dissemination, awareness and educational activities, together with the integration of international students within local communities (e.g. multicultural integration in local language courses).

### **1.5 The EMSHIP<sup>+</sup> EMJMD Consortium is highly relevant with regard to internationalisation in higher education and has been designed to maximise the benefits of student and staff mobility.**

Strategic criteria were used to develop the EMSHIP<sup>+</sup> Consortium: education field, scope, profile, European and global scale coverage, sustainability of the programme, and employability of the EMSHIP<sup>+</sup> graduates. They altogether combine different expertise covering all educational aspects included in EMSHIP<sup>+</sup> (multidisciplinary, transversal research, etc.).

Academic Associates (*Annex C: Associated Partner Presentations*) provide also a combination of research expertise, scopes, profiles and experience that are consistent with the EMSHIP<sup>+</sup> programme. Most have on-going postgraduate programmes, with contents that complement the EMSHIP<sup>+</sup> programme. They act as antennae to attract students and scholars from different parts of the world and as recipients to host EMSHIP<sup>+</sup> students during their research work. This will provide the students with the opportunity to undertake their research in any part of the world (Australia, North America, South America, Asia, Middle-East and Africa).

The Consortium partners are all involved in the two most reputed international scientific associations linked to Ship Hydrodynamics : the International Towing Tank Conference (ITTC, [www.ittc2017.com](http://www.ittc2017.com)) and the International Ship and Offshore Structures Congress (ISSC, [www.issc2018.org](http://www.issc2018.org)); in many EU projects (FP and H2020 projects) like IMPROVE, VIRTUE, BESST, JOULES, HOLISHIP, and have outstanding experimental facilities.

#### **a) EMSHIP<sup>+</sup> supports the internationalisation of European higher education and the cooperation will be implemented in the partner HEI internationalisation strategies**

The nature itself of the EMSHIP<sup>+</sup> Consortium supports internationalisation as it is composed from partners and associates from all over the world. **Internationalisation is a key target for all the partners** (see partner’s strategies in Table 4.2). EMSHIP<sup>+</sup> is in line with these strategies and indeed contributes to:

- foster partner Universities reputation and increase their attractiveness. Indeed, EMSHIP<sup>+</sup> encourages international recruitment of excellent students. Nevertheless the reputation of excellence attached to the EMSHIP<sup>+</sup> EMJMD is not limited to the only faculties involved, but spreads to the entire institutions members of the Consortium, which gives them an outreach towards potential international partners or networks;
- the development of transdisciplinary programmes, building bridges between complementary disciplines or international teams which can lead to further cooperation through research programmes as a spin-off effect;
- new pedagogical methodologies learnt by collaboration with partners having other approaches;
- increase rate of courses taught in English, not only in the EMSHIP<sup>+</sup> programme but beyond as a spill-over effect, to other Master courses, which is beneficial to international students as well as local students;

- embed soft skills into the training, through the use of foreign languages, the necessity to adapt oneself to diversity (social, cultural, pedagogical, etc.), and contribute to the employability of the students;
- internationalization@home: local students benefit from the presence of international students and professors within international classrooms, but even to a lesser extent by the presence of international students on the campus;
- on a broader scale, to the social role played by the University in a city, by hosting foreign students into the local life;
- raise the level of the administrative staff, who gained through the years a great experience in the use of English, the hosting of foreign students, the specificities of joint programmes (common exams rules, double diplomas editing, etc.).

The best EMSHIP<sup>+</sup> potential achievements are clearly outlined in EACEA assessment reports (Quality Review in 2014 - Ref: EMMC FPA 2010-0142) in which we can read: *“EMSHIP<sup>+</sup> ... has been drastically updated to provide a multidisciplinary approach in Advanced Design of Ships and Offshore Structures. This new programme enhances internationalization, and improves learning and employment outcomes through the support mechanisms already in place and validated at the participating institutions. EMSHIP program is highly internationally driven”*.

The Consortium has 7 international associated university partners (Fig 1.4), which are key players in their region/continent (Annex C: CV's of associates). For examples, **UFRJ (Brazil)** is ranked “Top 1” in Brazil in Offshore Engineering. **PNU-KOSORI (Korea)** ([www.kosori.org](http://www.kosori.org)) is a global hub organization, unique in the world, leader in structural integrity of ships and offshore installations against extreme events. **ITU (Turkey)** has a huge potential in terms of students, as the education level in Turkey is very high. Bachelor graduates are looking for opportunities to study abroad, and EMSHIP<sup>+</sup> will welcome them. **Southampton Solent University (UK)** is internationally renowned for its expertise in yacht design widely acknowledged by both industry and academia. SOLENT is a new partner with a high potential owing to new facilities of 150 million Euros, including state-of-the-art learning and teaching facilities.

**Internationalization** is achieved through the institutional cooperation between the EMSHIP<sup>+</sup> partners resulting in 3 double degree diplomas (Annex D1), accredited by the concerned partner university countries (Belgium, France, Germany and Poland). Mandatory student mobility is crucial for internationalisation. Multiple opportunities between Partners and Associates, including placements in academic and industrial partners are an essential part of the EMSHIP<sup>+</sup> programme.

Many students may perform internships and master theses with the EMSHIP<sup>+</sup> international associated partners. We have also extended the partnership of the EMSHIP<sup>+</sup> Industrial SAB to international industrial partners, such as OMCS Class in Panama or Delta Marine in Turkey. We also reinforced the international visibility of EMSHIP<sup>+</sup> by participating in events as ISSC'2018 world conference (co-organised by ULiège - [www.issc2018.org](http://www.issc2018.org)).

**EMJMD Alumni show higher participation in professional networks and face lower unemployment** (<https://esn.org/erasmus-impact-study>). Average for EMJMD is 85% but EMSHIP reached 98-99% after 1 year (see Annex A1: Statistics). EMSHIP<sup>+</sup> Alumni network includes non-educational and non-academic Associated Partners (as WEGEMT) to enhance employability across Europe and worldwide.

#### **b) EMSHIP<sup>+</sup> will bring positive and long-lasting effects on the students**

Positive and long-lasting effects for the EMSHIP/EMSHIP<sup>+</sup> graduates (Alumni) are guaranteed by:

- Keeping close contact with the Alumni, sending regular information, emails, invitations and job opportunities;
- Maintaining the EMSHIP<sup>+</sup> website and list of Alumni (name, picture, position) to promote networking, keeping Alumni's access open to the LMS intranet, keeping links with academic staff and former colleagues;
- Inviting Alumni to EMSHIP<sup>+</sup> events as EMSHIP<sup>+</sup> week to report about their former experience and their professional position, the EMSHIP<sup>+</sup> graduation ceremony and to technical seminars related to their job/activities;
- Inviting Alumni to assign representatives to the EMSHIP<sup>+</sup> MMC (as well as 2 students' representatives).

#### **c) Students will improve their learning performance and staff improve their professional competences**

EMSHIP<sup>+</sup> Consortium partners are committed to deliver improved and effective teaching and learning practices, thus enhancing students' learning performance and staff professional competences, and contributing to improve higher education across Europe. Together with conventional lectures, seminars, labs and technical visits, new educational practices will be adopted, including active learning methods such as problem-based learning exercises, journal clubs and team-based learning, in order to improve student learning and knowledge retention. Furthermore, technology is taking a greater place in the delivery of the course, to enhance student engagement online, but also is allowing staff monitoring of the student commitment to provide additional support where needed and reflection on self-practice.

Compulsory internship is the guaranty to get professional and technological competences and not only academic or scientific ones. A mix of both makes the graduates ready for their professional life, with the highest chances of success. In addition, the mandatory mobility is essential to the learning outcomes and to the success of the programme, developing communication skills and multicultural knowledge of the students.

EMSHIP<sup>+</sup> scholars are recruited from associated partners all over the world, contributing to internationalization and excellence in the Consortium, but also to improve student knowledge and university staff ability/awareness.

The university teaching staff, both junior and senior, from associated partners often not familiar with teaching activities, will benefit from individual and joint academic activities (lectures, seminars, visits and experimental tests, assessment, and vivas) carried out during the realisation of the programme; thus contributing to improve their professional competences and transferable skills, as well as to promote multidisciplinary scientific networking both international and inter-sectoral.

Under the leadership of SOLENT University, which has been internationally awarded for its innovative and good practice

in teaching, lecture capture technology has been employed. Through the use of a special software (Panopto), and high-tech microphone, the content of the lecture (slides projected on the board, lecturer's speech, but also lecturer notes on the smart board) are all recorded and uploaded online for the students. This can also be streamed live online. With students from all around the world, this is a fantastic technology to promote student's success.

#### d) EMSHIP<sup>+</sup> enhances intercultural awareness, foreign language competences, and other transferable skills

**Internships, technical visits, EMSHIP<sup>+</sup> weeks** and the 3 **mandatory mobilities** (even 4 with the summer traineeship) are the guaranty for **intercultural awareness, foreign language competences** and not only from an academic point of view.

**Intercultural awareness:** at ULIège, ECN, URO, ZUT and UPM, the EMSHIP<sup>+</sup> students will be immersed with local students (typically 2/3 of locals) for about 50% of their lectures. This is excellent for the social integration, promotion of exchange, learning language, not only for EMSHIP<sup>+</sup> students, but also for local students who will benefit from *internationalization@home*, which will contribute to enhance intercultural awareness of all students.

Intercultural awareness is promoted through daily life in university and outside of work, technical visits, EMSHIP<sup>+</sup> weeks, welcome day organised by International departments, winter break lunch where students share their typical food, and also sport events organized by universities.

Through internships and technical visits, students also gain an appreciation for the various professional attitudes and work ethics in various countries and cultures, preparing them better for a highly international career, and promoting their employability across the globe. This is further emphasised during the EMSHIP<sup>+</sup> Week, organised in a different country every year, which is gathering professionals from across Europe for the students to interact with.

**Language competences:** students can learn local language as French, German, Polish, Spanish, and of course English, at the different universities (for free). English is the language of science, engineering, communication and management. The ability to work in English is needed for European competitiveness at a global scale. Within the EMSHIP<sup>+</sup> curriculum, there is an emphasis on critical reading, quantitative assessments, writing and other presentation skills, researching information and evaluating literature sources. There is also an opportunity for students to gain foreign language competences within a formal course setting. Indeed, all Consortium universities offer language learning support through training courses in several European languages (see Section 2.4.c and Annex B2: Student Supports). In some of them, **the language course is mandatory and must be validated to gain the double/joint diploma**.

**Transferable skills** that EMSHIP<sup>+</sup> delivers through the programme are:

- Entrepreneurship capacity (Section 4.3.a) enhanced by student participation in international contests in innovative ship design (as TRAVISIONS ).
- Communication ability (Section 4.3.b),
- Management skill, which is developed by lab work and projects in groups among other ways.
- Languages (see above) through courses but also through all other aspects of daily life in university (students' association, sport, culture...) and outside.
- Academic awareness (see list in the Learning Outcomes Section 1.4.c): scientific curiosity, knowledge to address familiar and unfamiliar scientific or technological issues, etc.
- Open-mind, scientific and human understanding resulting from all previous aspects.

## 2. Quality of the project design and implementation

### 2.1. Academic programme and learning outcomes and details how the excellent academic content will be offered.

#### a) EMSHIP<sup>+</sup> is designed to guarantee academic excellence

EMSHIP<sup>+</sup> provides a **diversified EMJMD programme** in "Advanced Design of Ship and Offshore Structures" with attractive outcomes (Fig 2.1).

The content of the EMSHIP<sup>+</sup> programme and learning outcomes (Section 1.1) are detailed in Annex D4. The lecturer capacity, their CVs and their institution abilities are detailed in Section "Skills & Expertise - p. 46-54" for the 9 EU Consortium partners and in Annex C for the 8 international associated partners) in the framework of an extensive and validated mobility plan (see Fig. 2.3).

The academic excellence is guaranteed by the following elements:

- Academic partners which are among the most renowned in their respective field;
- All academic partners have a wide activity in research and development from an academic point of view with an active participation to ISSC and ITTC conferences, through European and International research projects, through strong link with various industrial partners (including SAB members);
- Outstanding professors, internationally well-known, are involved in the education as Prof Ferrant (ECN, ITTC, OMAE), Prof Rigo (ULIège, ISSC'2018 Chair), Prof Kaeding (URO), Prof Taczala (ZUT), Prof Lungu (UGAL) but also JK Paik

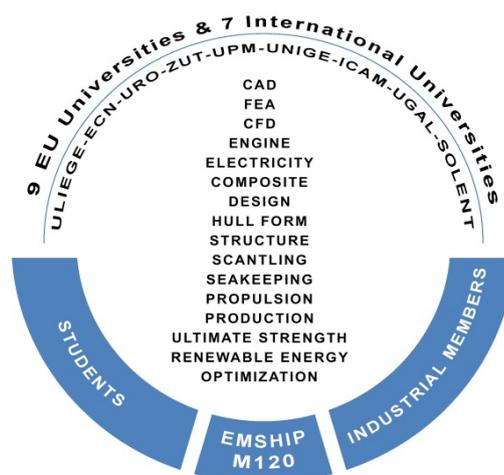


Fig. 2.1: EMSHIP<sup>+</sup> main outcomes

(PNU) and A Troesch (UoM);

- A team of Industrial partners (SAB) expressing their ideas and proposing their recommendations about education proposed to students in the EMSHIP<sup>+</sup> programme;
- The support of outstanding associated partners from USA, Japan, South Korea, Australia, Brazil...
- The extensive use of qualified scholars for lectures and guests from industry for seminars;
- An effective EMSHIP<sup>+</sup> Alumni team, which supports the Consortium universities;
- Clear selection procedure and high level of background prerequisite (see Annex B4);
- A Quality Assurance procedure clearly implemented based on extensive students' surveys;
- Eight years of experience gained from former EMSHIP EMMC, with most of the same partners.

The programme is continuously improved to better fit industry's needs and student's expectations (Fig 2.2), by upgrading the lecture content but also by proposing innovative teaching approaches.

For that purpose **Southampton Solent University** has a strong commitment to learning and teaching and is the leader of these aspects in the EMSHIP<sup>+</sup> programme. Solent has received the "Most Improved University" award by the Times Higher Education in 2015 and was graded 5 out of 5 stars by the prestigious QS world ranking in 2017.

#### **b) Teaching approach and learning/research methods and how to ensure the delivery of excellent academic content**

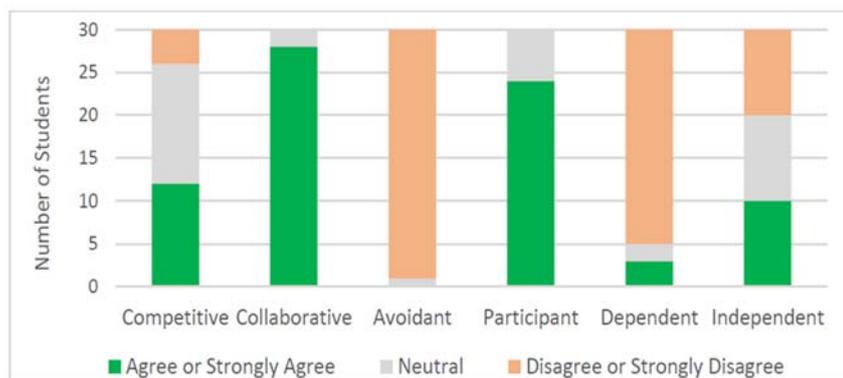
EMSHIP<sup>+</sup> lectures (Annex D4), seminars and project work are strongly linked to various specialisations in the field of ship, offshore and MRE engineering. All teaching staffs are deeply involved in **top-level current research topics** (Ship Structure optimisation with HOLISHIP H2020 project, reduction of ship consumption by improvement of routing software with the French OPTIROUTES project, use of European offshore renewable energy testing facilities with the MaRINET2 network, PROMARC at URO and VISIONS) and thus new developments are directly reflected in the courses.

Moreover, conferences and seminars proposed by industrials (from the SAB or others) are encouraged to allow students to discover issues encountered in industry.

Whereas the theoretical background is taught by engaging students to actively attend lectures, **the application to problems is practised in lab works, and project groups**, which encourage them to become **enterprising individuals**. This dual approach also includes the use of **state-of-the-art computing environments**. The purpose is to develop learning-by-doing approaches, ability to work within groups and initiative of students.

Finally, the duration of internships (5 months) and possible traineeships between the 1<sup>st</sup> and the 2<sup>nd</sup> year of the programme allow students to get to know the world of industry and business, to be confronted to real industry projects and issues and to develop their know-how and their own individual initiative.

In order to achieve academic excellence through teaching methods, which promote the acquisition of the intended learning outcomes in engaging and stimulating way for the students, their learning style has to be assessed.



This is even more critical in a course such as EMSHIP<sup>+</sup> with a wide array of backgrounds. At the start of the course, students are asked to fill a questionnaire in to assess their preferred learning style, as presented below.

The strong collaborative and participative nature of the students implies that **group projects and knowledge-sharing tasks** and **discussion** should be preferred to individual tasks and standard lectures. The evidence of the appreciation of this strategy is that the highest *appreciated EMSHIP<sup>+</sup> lectures* by the students were those which mainly featured this approach (Fig. 2.2). Moreover, the recent implementation of the lecture capture technology, together with micro-lecture with embedded quizzes (5 min summary videos with short quizzes for students to revise at home and engage with the course material) has been very positively received, with over 85% of EMSHIP<sup>+</sup> students strongly agreeing that this should be fully employed in the course. So, the EMSHIP<sup>+</sup> Consortium has decided that students will have access to all recordings (online) to catch up with lectures, revise for exams and deepen their knowledge in an engaging way.

#### **c) Innovative features have been included in the coverage of the targeted academic field/subjects**

The programme offers an interdisciplinary combination of technical, scientific and management skills and the opportunity to experience a variety of academic and cultural environments through a mobility scheme including 3 mobilities. This set-up of the programme provides the students with a solid and broad background for future challenges in the marine industry.

The lecture halls are generally equipped with *smart-boards* in addition to conventional projectors and black boards. In the digital era, it is vital for Higher Education teaching to adopt more technology enhanced learning, not only in the way the content is delivered, but also shared. This includes the use of modern technology, such as touch screen allowing the professor's notes to be digitally recorded and later accessible to the students. Moreover, the use of *captured lecture notes*, successfully experimented on the EMSHIP<sup>+</sup> course, has proven extremely beneficial to the student's learning.

### **2.2. The proposal describes a set of internal and external evaluation methods of the EMJMD, how they will be put into practice and used to monitor, upgrade and improve the quality of the course**

### a) Quality assurance standards and procedures have been agreed upon

The EMSHIP<sup>+</sup> MMC has already informed the relevant national authorities of the existence of this agreement and made sure that in its application, it does not contradict any national regulation.

The EMSHIP<sup>+</sup> MMC considers **quality assurance procedures of the utmost importance** to continuously develop the excellence of the EMSHIP<sup>+</sup> Master Course. To ensure this, each university has a number of basic principles about quality assurance, both internal and external, which include the following issues:

- Regular assessment of their study programmes by national accreditation organizations;
- Compliance with the **European Standards Guidelines (ESG)** of the EHEA;
- Use of external expertise in quality assurance; and encouragement of a culture of quality;
- Students' selection, examinations and thesis review are done in accordance with the regulations;
- The Consortium Universities have demonstrated their quality at home and internationally (see Skills & Expertise);
- Processes used will not stifle diversity and innovation.

The rules for the exams organisation, deliberation, rating, etc. have been established (Annex F: Student Agreement).

### b) The quality assurance standards and procedures are compatible with the Standards and Guidelines for Quality Assurance in the EHEA (ESG) and the EU Approach for Quality Assurance of Joint Programmes

The entire QA system implemented in the framework of the Consortium and individual of each partner is based on the issues formulated by the ESG QA standards, as following:

#### ESG for internal quality assurance:

Each Consortium University will follow closely the impact of the courses on the student's competence through an evaluation protocol using the "EMSHIP<sup>+</sup> student questionnaire" developed by the MMC (both at the course and programme level). These questionnaires will be on the LMS and used at the end of each semester. Then, these anonymous on-line questionnaires are analysed at the next MMC in order to take appropriate actions.

→ Policy for quality assurance - The MMC has designed internal procedures on each item formulated by ESG standards which are in full agreement with own partner institutions' local quality assessment methodologies.

For example, ULiège has an internal **Quality Office** and one **Quality Counsellor** attached to the Rector which helps the University and its faculties to prepare external evaluations, such as the one lead by the *European Universities Association* (EUA) or the French CTI (*Commission des Titres d'Ingénieurs*). The coordinating university is located in Belgium, which allows easily the Coordinator to attend all the information sessions and cluster meetings organised in Brussels by EACEA (or AEF-Europe) on the topic.

→ Design and approval of programmes - An internal evaluation of the programme is done by the Strategic Advisory Board (SAB) composed of companies of the naval and offshore field. Each year, the SAB members take part in EMSHIP<sup>+</sup> MMC meetings advising the MMC about new needs and demands of the industry, research level in the naval architecture, naval and offshore engineering. Thus the educational programme can be adapted following these proposals.

Moreover, each partner is reviewing the syllabus for the allocated disciplines, so that the coherency of the training along years and a **smooth student progression** are ensured during the studying process. In addition to the academic content, transferable and soft skills are taken into account through the use of English, the group works and the contacts with industries. In this process, the SAB members and the students are also involved.

→ Student-centred learning, teaching and assessment - Each partner university dealing with a group of students is identifying the initial level of the enrolled students so that the teaching methodology is adapted each year in order to ensure the maximum learning outcomes on each individual. The teaching process is based on **flexibility, combining a variety of pedagogical methods**, classical and modern, combining the theoretical issues with the practical aspects (see Section 2.1.b). The groups are formed to ensure a sense of **autonomy** for the students with the adequate **guidance** from the professors, through a maximum communication between teacher and student, the local advisers playing a significant role.

The students have the opportunity to receive feedback on their evaluations and they have the right to address an **appeal** through a defined procedure if they feel unfairly treated.

As internal quality assurance, the EMSHIP<sup>+</sup> Alumni Association and their employability monitoring (Annex A2), contribute to the improvement of the academic process developed for the EMSHIP<sup>+</sup> program. The grades for each student are recognized through the ECTS system ([http://ec.europa.eu/education/ects/users-guide/index\\_en.htm](http://ec.europa.eu/education/ects/users-guide/index_en.htm)) and a grade conversion table jointly defined by the EMSHIP<sup>+</sup> MMC partner universities (see here after in Table 2.1).

→ Student's admission, progression recognition and certification (Annex B4) - To ensure a quality learning outcome of the EMSHIP<sup>+</sup> program, beside the requirements on the academic and administrative components, an adequate selection of the enrolled students is required. The EMSHIP<sup>+</sup> website includes the eligibility conditions, description of all courses planned in the programme, the requested documents and the application forms for the potential candidates for the EMSHIP<sup>+</sup> Master program. Details about admission are given in Section 2.4.a.

**Transparency of certification** is assured by the delivery of a **Diploma Supplement** detailing the qualification obtained, learning outcomes achieved, programme followed, partners universities, etc.

→ **Teaching staff** - Each university involved in the EMSHIP<sup>+</sup> Master program, based on the experience in their national education programs, selects the most suitable teaching staff, highly qualified and competent to deliver the lectures included in the EMSHIP<sup>+</sup> Master curriculum.

Moreover, scholars, selected by the EMSHIP<sup>+</sup> MMC, teach in each partner university delivering a Master diploma. Selection of scholars (based on online application, see Section 4.4.a) is done by the Consortium in order to deliver specific lectures on different naval architecture, ship and offshore engineering topics, increasing the quality of the program and different prospective on educational process (see Section 2.3.d).

→ **Learning resources and student support** - Each university is responsible for ensuring adequate learning resources, providing a high quality educational standard. The learning resources will include support for all the student academic activities: written support for lectures (posted on LMS), libraries, computing facilities, experimental facilities such as towing tank and offshore wave basin, and a continuous tutorial.

→ **Information management** - For a consistent and coherent internal quality management system and communication between all partners, the Consortium has developed an efficient **learning management system** (LMS) available on internet. So, the Consortium universities are able to collect, save, analyse and prepare the necessary information for a quality management of all the components of the academic process into the EMSHIP<sup>+</sup> programme. LMS makes possible the communication between the EMSHIP<sup>+</sup> partners, teaching staff, students, associated partners and SAB members.

→ **Public information** - The EMSHIP<sup>+</sup> MMC has already provided public information on its website concerning the curricula of the program, objectives, financial support scheme, admission criteria, partners' background, learning outcomes, alumni, industrial partners, master thesis topics and graduated employment information on different channels of communications.

→ **On-going monitoring and periodic review of the programmes** – the entire QA system provided by the Consortium partners is oriented for a periodic monitoring review and revision of the Master programme on the activity details, in order to improve and provide a high quality teaching process.

### **European Standards Guidelines (ESG) for external quality assurance:**

#### **→ Periodical external quality assurance**

EMSHIP<sup>+</sup> Consortium will undergo periodically an **external quality assurance process of the EMSHIP<sup>+</sup> programme as a whole**, using the same items as internal QA. Each EMSHIP<sup>+</sup> partner will deliver periodically a self-assessment QA report on the ESG items, which will be first presented, reviewed and approved by the EMSHIP<sup>+</sup> MMC. Then these self-assessment QA reports will be submitted to a QA agency, member of ENQA ([www.enqa.eu](http://www.enqa.eu)) for an external QA procedure, which includes site visits to university partners and review of all the partners' QA internal reports (required by their national procedures). The QA agency's recommendations (and follow-up actions for each partner) will be presented and analysed by the MMC. So, specific measures will be identified by the MMC and also a common strategy will be decided in order to fulfil all the criteria for the academic outcomes of the EMSHIP<sup>+</sup> programme.

In order to increase the compliance with the industrial requirements, the EMSHIP<sup>+</sup> Consortium will submit an external QA by a professional organisation from the list of Shipbuilding Classification Societies, member of IACS. This activity will be carried out periodically and coordinated by MMC.

#### **c) Partners & players, and Methodology of the internal and external project evaluation.**

The EMSHIP<sup>+</sup> MMC is the **key body for quality assurance**. Students and Alumni representatives are invited for all topics concerning the quality of teaching. This committee defines all the regulations of the Master programme (see details in Annex E: Consortium Agreement), and notably:

- Selection of the students for the Master and selection of scholarships through a transparent and auditable way.
- Decisions about the financial regulations and particularly the distribution rules of the tuition fees.
- Development and maintenance of quality schemes to be implemented for the continuous development of EMSHIP<sup>+</sup>.
- Development and implementation of procedures to guarantee the sustainability of the EMSHIP<sup>+</sup> Master programme and promotes the employability of the students.

The **industrial SAB** (Annex A4) composed of decision makers of leading maritime companies will function as an independent expert team to review the programme and give advice on how to improve it. **The associated partners**, who are not members of the Consortium Universities, have a role of advisers, promoting in Europe and overseas and organising seminars and quality assurance assessment.

The **internal evaluation process** is based on anonymous evaluation questionnaires, while the **external evaluation** uses the feedback of the industrial SAB and a Classification Society (or the Royal Inst. of Naval Architecture - RINA).

Beside the current external evaluation provided by the SAB members, EMSHIP<sup>+</sup> will have an external accreditation done by national quality assurance agencies, members of ENQA ([www.enqa.eu](http://www.enqa.eu)).

For EMSHIP<sup>+</sup>, the 4 partners delivering the 3 double Master degrees have obtained their accreditations from their respective national authorities:

- **ULiège** by AEQES (*Agence pour l'Évaluation de la Qualité de l'Enseignement Supérieur, Belgium*). The Master in Mechanical Engineering involved in the EMSHIP<sup>+</sup> programme has been recognized by the Decree in 2013 and accredited in 2016 by the French CTI (*Commission des Titres pour l'Ingénieur*).
- **ECN** by HCERES, the French Ministry for Education, Research and Innovation (*Haut Conseil de l'Évaluation de la Recherche et de l'Enseignement Supérieur*). The Master in Hydrodynamics for Ocean Engineering involved in the EMSHIP<sup>+</sup> programme has been accredited in 2017 for 4 years.
- **URO** by GAC (*German Accreditation Council*). The future accreditation of programme proposed by URO in EMSHIP<sup>+</sup> will be done by URO itself as URO is now recognized as “self-accrediting university” by GAC.
- **ZUT** by PKA (*Polish Accreditation Committee*). The Master in Naval Architecture has been accredited in 2015.

The accreditation of the joint Master degree between UPM and ULiège is currently under review by ANECA (*Spanish Accreditation Agency*).

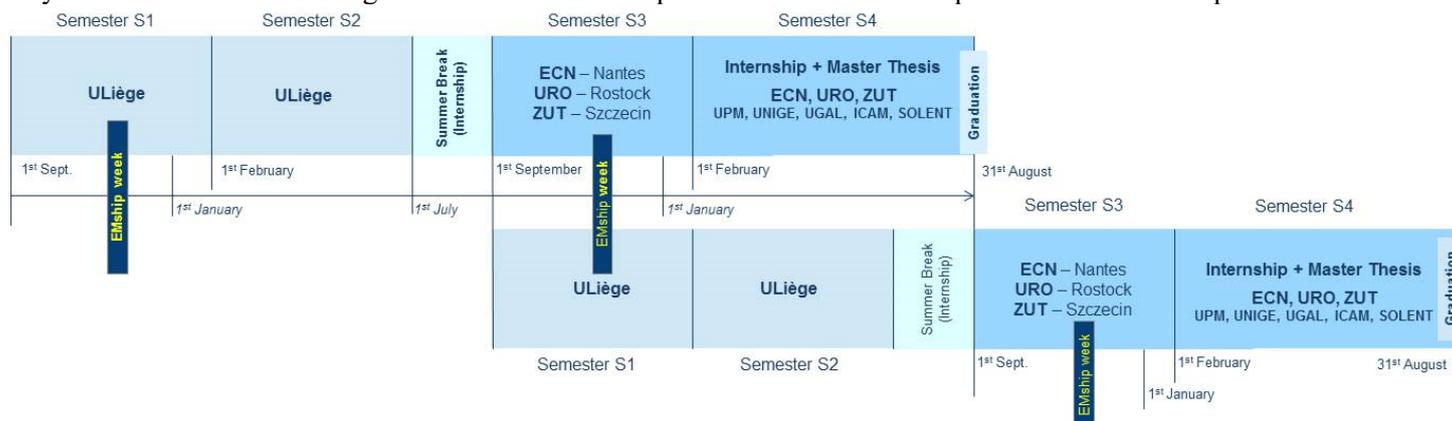
#### e) The assessment outcomes has been considered for monitoring, upgrading and improving the overall quality

The syllabi of the offered courses are **yearly revised** and thoroughly discussed to avoid gaps and overlaps of the contents, both in terms of complementarity and completeness. This discussion takes place at the meetings of the MMC. The **student surveys** are performed using LMS as support and their results are taken into account **to update accordingly the course content**. Regular contacts between lecturers will be organised, in which the experience gained will be discussed and actions taken, to enhance the learning outcome of specific lectures.

### 2.3. The proposal defines how the student mobility is organised and is instrumental to the course objectives, and presents a draft strategy/planning for an effective involvement of scholars/guest lecturers

#### a) The student mobility is organised around the course modules

The overall structure of the mobility scheme is detailed Section 1 (Figs 1.1 and 1.2) and in the Student Mobility Plan (Fig.2.3). During the 1<sup>st</sup> year, students are located at ULiège (Liège, Belgium) for 60 ECTS of courses. In 2<sup>nd</sup> year, they are moving to a 3<sup>rd</sup> semester of lectures at ECN (Nantes, France), URO (Rostock, Germany) or ZUT (Szczecin, Poland), and a 4<sup>th</sup> semester for the master thesis and internship, according to the specialisation offered by each university and keeping a smooth balance of students allocation. Thus each student studies at least in 2 universities (up to 3 universities including the internship) and stays at 3 locations considering the location of the companies where the student performs his internship.



**Figure 2.3: The EMSHIP<sup>+</sup> timeline with the key mobilities and dates for successive cohorts**

For the 4<sup>th</sup> semester, mobility can be achieved in one of the other European Consortium Universities (UGAL, ICAM, SOLENT, UNIGE, UPM) or non-European associated Universities (ITU, UFRJ, OSAKA, UoM, PNU, UNSW and USTO). During this last semester, the master thesis project is completed through an internship in an industrial company or a laboratory, always under the supervision of one of the partners delivering the Master degree. Master theses are co-supervised and co-reviewed by the 2 or 3 involved partners.

The student expresses a choice for the mobility path, but this is ultimately validated by the Consortium to guaranty a balance between the partners and coherence and feasibility between the lectures, internship and master thesis.

#### b) Plans for ensuring effective academic induction of the students, especially those coming from Partner Countries

To tackle the issue of students coming with **different academic backgrounds** (and cultures), we organise at ULiège special induction lectures to equalize the levels. These lectures start one week before the formal starting date of 1<sup>st</sup> year of the programme and continue during 3 weeks (they are not mandatory, but recommended). After one semester, due to special attention and supports, the differences almost disappear.

In the framework of LMS (Intranet) all the lecture documents will be available online one month before lectures start, so students can check, read and identify if they need to attend the preliminary lectures. In addition, each student has a personal access, protected by password, to communicate with the professors and the other students (Email, LMS-Intranet).

The same process is planned at ECN, URO, ZUT (and UPM) at the beginning of 2<sup>nd</sup> year.

In addition, students will obtain specific supports from the International Offices of each Consortium University (Annex B). Students will find qualified people who speak various languages, whose job consists in helping foreign students from worldwide. All the International Offices of the partner Universities have a great experience of these situations, through Erasmus Mundus or many other programmes. Besides, cultural activities are organised to gather international students (Section 2.4), and based on the EMSHIP experience, specific attention is paid to inform students about the pedagogical aspects, lecture delivery modes and assessment methods (in particular, oral exams which many international students are not familiar with).

#### c) EMSHIP<sup>+</sup> students often meet and exchange (from the same and different EMSHIP<sup>+</sup> cohorts)

The students of each cohort stay together during the 1<sup>st</sup> year, so that they can build a real **team spirit**. During the 2<sup>nd</sup> year this group is basically split into equal sub-groups at ECN, ZUT, URO (and UPM).

All the students meet together with the previous/next cohort at the annual EMSHIP<sup>+</sup> week and the graduation ceremony. They have the opportunity to **exchange and learn from the experience gained by their peers**, as well as already developing their **network** for their future careers.

In addition, at least once a year, Alumni meetings are organised by the EMSHIP<sup>+</sup> Alumni team in various places (Amsterdam, Brussels, Hamburg...). Finally, through the social networks (Section 1.1.c) (Facebook, LinkedIn...), students of various cohorts can exchange and strengthen their links.

#### d) Strategy/planning to ensure that invited scholars/guest lecturers benefit the students

The experience gained and the links and network developed between industrial partners and associated universities in the Consortium, have led to a very good understanding of the strengths and specialization of the several stakeholders involved, which gives the Consortium the certainty to recruit excellent scholars (Annex B3), but also industrial guest lecturers for short seminars (SAB) with ad-hoc competencies for the lectures to provide. Some of them have been selected for several years and their knowledge of the programme helps them to be adapted to the public.

Every year, the call is open to new scholar candidates according to the objectives and the learning outcomes defined by the MMC. Scholars will be selected during MMC meetings, based on needs and wishes of the Consortium partners, feasibility for scholars to support students' projects, supervision of master thesis, start or continuation of joint research... In particular, we plan to invite Profs from UFRJ (Brazil) and ITU (Turkey) to reinforce our cooperation with South America and Middle East, as they are targeted regions for recruitment. Moreover, these scholars will help us to identify industrial companies in their own countries, for internships and job opportunities.

In addition to the scholars funded by the MMC, we will have short seminars (typically 2 days) given by **industrial partners** including **shipyards** ([www.abeking.com](http://www.abeking.com)), **developers** ([www.friendship-systems.com](http://www.friendship-systems.com)), **Class. Societies** among others, in order to bring the EMSHIP<sup>+</sup> education closer to industry and the future students to professions. We also invite **EMSHIP<sup>+</sup> Alumni** (9 came in Hamburg in Feb 2019) to give seminars about their experience and projects.

### 2.4. **List of information provided to the students/academic staff prior to course enrolment, and the services offered in terms of support for accommodation, language training, administrative formalities (visa support), and insurance**

#### a) The student application/selection procedure is jointly organised by the entire Consortium.

**Student's Admission** (Annex B4): the rules for admission have been jointly determined by the partner universities taking into account each partner prerequisites, according to the following:

- Students with at least a Bachelor's degree in mechanical engineering, naval architecture, or ocean engineering ... (with a minimum of 180 ECTS), or its equivalent, can apply for admission.
- **European B2 English level is required** (attested by a certificate) for non-native English speakers.
- Even if there is no formal minimum requirement as a GPA (grade point average), students will be **selected first on basis of excellence**, and their GPA will be considered as a major criterion. Candidates have to fill a detailed list of prerequisites in, which is a key document for the selection. Students have to supply a motivation letter including description of the reasons for the application to the EMSHIP<sup>+</sup> Master Course.
- A common procedure for students' selection and admission has been approved by MMC (acting as students' selection board). This transparent procedure will be applied to both non-European students and European students.
- The Consortium has defined the rules prevailing for the distribution of students among the Universities. The students allocation between ECN, URO, ZUT and UPM (Fig. 1.2) for the 2<sup>nd</sup> year (M2) will be decided a few months (around April) before the end of the 1<sup>st</sup> year by the MMC, considering the wishes of the students but also keeping in mind a balanced distribution, so that all partner universities are equally involved.
- Once the student applications have been accepted by the EMSHIP<sup>+</sup> MMC, and according to each student mobility scheme, every Consortium University hosting students enrolls them using a common shared administrative file, prepared by ULiège at the 1<sup>st</sup> registration (admission).
- Upon registration, all students are required to sign a Student Agreement (Annex F) available on the EMSHIP<sup>+</sup> Website, which content is defined by the EMSHIP<sup>+</sup> MMC, specifying their rights and duties.
- The concerned universities (ULiège, ECN, URO, ZUT and UPM) will reserve a sufficient number of study places in the classes for the selected EMSHIP<sup>+</sup> students.

#### b) Services and information to students/scholars at the host institutions before and during their mobility periods

Students and guest professors are contacted by the International Office of their destination, as soon as their selection has been confirmed. They receive all practical information for their administrative formalities and the related documentation required by the Embassies/Consulates. Individual and additional supports are provided whenever it is asked, and regular updates are sent all along the months before the arrival of the participants, e.g. to check their visa application status or give advice on how to register for preparatory courses.

Centralized services and information provided to students/guest lecturers before and during their mobility include the Student handbook (a version for M1 in ULiège is provided to students before programme starts and one of the 3 other versions, according to their destination in M2, is sent 5 months in advance), the Student Agreement and some specific information from the partner universities (see Annex B2: Support provided by universities).

For instance, the “*Student Welcome Guide*” edited by the International Relations Office of ULiège is given to each student ([www.enseignement.uliege.be/upload/docs/application/pdf/2017-07/welcome\\_guide\\_17-18.pdf](http://www.enseignement.uliege.be/upload/docs/application/pdf/2017-07/welcome_guide_17-18.pdf)) in preparation of the 1<sup>st</sup> year and it includes: supporting documents, visa procedure, bank, accommodation, overall estimated living cost. Invitation letter is sent to scholars, who will also receive accommodation and travel support. All this information is available on EMSHIP<sup>+</sup> website through the FAQs page (<http://m120.emship.eu/faq-general>).

At each Consortium University, wireless internet connection will be devoted to the students use in the classroom. In addition, students will have full access to one of the computer rooms dedicated to students use in the campus. Each University has its own form of organisation (different types of cooperation between central international services and international services related to the different academic fields), but thanks to the experience gained through the previous EMSHIP programme; the Consortium Universities and their administrative staff have learnt to collaborate together efficiently for the benefit of the students. The EMSHIP<sup>+</sup> coordinator organizes also coordination between the different international offices of the Consortium Universities to guarantee a continuous and uniform assistance without breakdown when the students are changing of university.

### **c) Students support for accommodation, language training, and administrative formalities (e.g. visa, residence permits) are managed at each partner institution**

All partner universities have a strong experience with Erasmus Mundus programmes. They have implemented services and support to help students and give them a smooth integration within the University and the city where they are studying. The multiplication of Erasmus Mundus programmes in which they are involved has contributed to raise the level of the administrative staff, not only in the International Relations Departments, but also at Faculty level where administrative staff is used to address these student issues.

Due to the lack of space, we simply list here few typical supports provided to students; extensive list of information are provided in the EMSHIP<sup>+</sup> Consortium Agreement, Student Agreement, handbook (see Annex B2: Student Supports provided by Universities).

Accommodation: the Universities support the students and scholars by facilitating housing arrangements in public or private residences. For example, ZUT provides accommodation for foreign students. Each room has Internet access. Attractive room prices for students and especially for self-funded students are proposed: 115 Euro/month (see more info for all partners in Annex B2).

Language training: all the courses provided by the Consortium Universities within the Master course are taught in English. However, in order to promote the integration of students and the European cultural diversity, each Consortium University will propose a course of the local language during the stay of the students (free of charge). It must be noticed that French courses are mandatory for the M2 at ECN and lead to 4 ECTS (if francophone students are at ECN for their M2, they have to validate 4 ECTS in a course of English language).

For other universities a certificate of attendance will be delivered upon request, with the mention of corresponding ECTS.

Administrative formalities: the international offices will support students before their departure from their home country about visa formalities and upon arrival, and all along the programme for their settlement (residence permit management, accommodation, bank account opening, integration within the university, etc.) and day-to-day lives.

Support at the coordinating university: The international office of ULiège has broad opening hours and 4 full-time staff members, who are used to help foreign students in their domestic and logistic needs. They provide information about formalities such as permits of stay and health services, but also social and cultural activities contributing to their integration.

Support at ECN, URO, ZUT (2<sup>nd</sup> year) and UPM, UNIGE, UGAL, ICAM, SOLENT (4<sup>th</sup> semester - master thesis): The relevant offices of these partners provide prospective students with information about their university, study programmes and admission procedures. The offices provide assistance in visa and accommodation issues. At URO, the *Local ERASMUS Initiative* cares voluntarily for all incoming students proposing a variety of activities.

### **d) The main features of the student insurance scheme adopted by the Consortium**

**All Students** will benefit from a private health insurance to complement the public health insurance scheme in Europe. This insurance will be paid by the EMSHIP<sup>+</sup> MMC as a part of the scholarship (from EACEA or from the Consortium) or the tuition fees paid by self-funded students.

**M1 (Master 1: 1<sup>st</sup> year of study at ULiège):**

It is compulsory for all students to register for Belgian public health insurance (“*mutuelle*”). If the student has a “European health insurance card”, he has to validate it in a public health insurance agency. If the student does not have this “European health insurance card”, he has to register in a public health insurance agency.

**M2 (Master 2: 6 months of study and 5 months for internship - under supervision of ECN, ZUT, URO or UPM):**

Depending on the country of destination, he will have to register for public healthcare system or not (instructions are given in 2<sup>nd</sup> year handbook, customised for the country of destination); the possession of the European health insurance card can ease procedure with the local public health organisation.

**e) Equity issues are addressed by EMSHIP<sup>+</sup> (e.g. balanced gender participation, students with special needs)**

The programme will promote a good balance of gender amongst students, but the priority in selection and admission is to promote quality and competences. In case of equality in those criteria, the less represented gender will be preferred. For all qualified students with special needs, assistance will be provided, as there is for instance a department dedicated to handicapped students at ULiège (“Service Qualité de vie”). For the 1<sup>st</sup> and 2<sup>nd</sup> intakes of the EMSHIP<sup>+</sup> programme (Sept 2017 and 2018), 35% of students are female, compared to 10% in the former EMSHIP (see also Annex A1).

**2.5. Course rules, student rights and obligations concerning the academic, administrative and financial aspects**

**a) Jointly agreed course rules and the student rights and obligations concerning academic, administrative, and financial aspects of EMSHIP<sup>+</sup> as outlined in its draft student agreement**

**→Jointly agreed course rules:**

Courses organised at partner universities are assessed using the ECTS system (see Annex B4). Concerning the examinations, they are done according to local regulations of the concerned university.

Joint deliberations are undertaken by videoconferences between ULiège and M2 partners (ECN, URO, ZUT, UPM) to unify decisions, especially in case of problems concerning a M1 student (see Section 3.3 and Annex B4).

Students, who fail exam(s) of M1 in January or June, can try again in late August (Fig 2.3). The latest approval to go for M2 will be given in late June or in early September. Students who fail their retake exams at ULiège (M1) in September will not be accepted to M2. In special cases, ECN, URO (and UPM) may accept students with min 55 ECTS from ULiège (M1), and ZUT with 50 ECTS (the missing ECTS must be recovered during the 1<sup>st</sup> semester of the 2<sup>nd</sup> year).

**→Student rights and obligations:**

The *Student Agreement* template (see Annex F) is sent to the selected participants and published on the EMSHIP<sup>+</sup> website together with the first information, just after the confirmation of their selection. The document contains all rights and obligations of the student during the programme. Upon arrival, the student will sign the Student Agreement during the registration process. During the academic induction, the task is to clearly remind all students of their rights and obligations, together with lecturers’ and administrative staff’s responsibilities.

Students will, if necessary, be provided with logistical support and will be assisted to fulfil all required administrative formalities and financial information (tuition fees and scholarships). All students will be provided with all the conditions and facilities described in the Consortium Agreement (Annex E) and the Student Agreement. The students undertake to respect the discipline imposed by the participating universities concerning its courses, its tasks, its working hours, the rules in force and any other legal provisions.

Students respect the examination rules of the programme, including regulations on transfers of ECTS and thoroughly read and observe the guidelines issued. Students should regularly and consequently keep the data up to date on their student’s LMS EMSHIP<sup>+</sup> webpage, communicate changes to the Secretariat in due time. In case a student withdraws, the Secretariat should be informed in advance and as quickly as possible. By signing the Student Agreement, students agree with these regulations.

**Table 2.1: Table of Grade Conversion**

ECTS	ULiège	ECN	ICAM	SOLENT	UPM	UGAL	UNIGE	URO	ZUT
A	18-20	A	18-20	A1	8.8-10	10	29-30	1.0-1.3	5
B	16-17	B	16-17	A2	7.8- 8.7	9	27-28	1.7-2.0	4.5
C	14-15	C	14-15	A3 – A4	6.8- 7.7	8	24-26	2.3-2.7	4
D	12-13	D	12-13	B1- B3	5.8- 6.7	6-7	21-23	3.0-3.3	3.5
E	10-11	D	10-11	C1 – C3	4.8- 5.7	5	18-20	3.7-4.0	3
FX	8-9	-	<10	D1 – D3	3.8- 4.7	4	11-17	5	2
F	0-7	F		F1 – F3	0 – 3.7	0-3	0-10		2

*Mark transfer and recognition* (Table 2.1): all courses of the double degree agreements are automatically recognized if passed. Marks (ECTS) are transferred according to the transfer chart of the double degree agreements. Each partner institution will use its local grading system, as well as the ECTS grading scale, in order to provide a greater transparency and ease the academic recognition of periods of studies spent at each partner institution.

The student will graduate if he fulfils the University requirements. The threshold for graduation is an average grade of “E” for the whole programme, and a grade of minimum “E” for each lecture, project, thesis and internship.

**b) Methodology for managing scholarships within the Consortium, especially the EMJMD funded scholarships**

**EMSHIP<sup>+</sup> EMJMD Scholarships:** regulations on the management of the scholarships are detailed in the Student Agreement. This includes details on the exact amounts of the scholarships, how and when scholarships are paid as well as the rules as described in the Erasmus Mundus programme guide on the use of the scholarship.

**EMSHIP<sup>+</sup> Consortium grants** for self-funded (Table 3.10): a similar procedure is applicable (see in Student Agreement). **Erasmus<sup>+</sup> Mobility grants** are also accessible to all students in Europe during mobility (about 200€/month) but not for EACEA scholarship holders. The International Dept. of the coordinator university will inform and assist the students to apply and receive these additional grants.

## 2.6. Effective integration/networking of the students within their socio-cultural and professional environment

**Integration** and **networking** are promoted through the entire EMSHIP<sup>+</sup> programme by all academic and industrial partners of the Consortium. In all universities, the classes are shared with local students to enhance intercultural awareness and contribute to the integration into the academic, social and cultural community (university/city life) – see Section 1.5.d.

Knowledge of English and host-country languages is of course essential for **integration** and is supported by possibility and/or duty to attend some language courses. In addition, all cultural and social events organized by universities, local student associations, cultural and sport associations... help also the integration of students.

Concerning **networking**, interactions and discussions with teachers, researchers or industrial stakeholders during classes can help students to have first ideas or contacts. Long-term internships (5 months), possible summer traineeships (between the 2 years) and EMSHIP<sup>+</sup> week provide a relevant experience in the real professional environment. Most of the master thesis topics are performed in industrial environment, which is the best approach to have a grasp of the world of work. All these events create networking opportunities and allow students to develop their own professional network for their future position in industry.

Moreover, lectures and discussions with scholars – high-quality lecturers coming from another part of the world with a different background and experience – allow students to enrich their point of view and are a new opportunity to develop their professional network.

Finally, the EMSHIP/EMSHIP<sup>+</sup> Alumni group is of primary importance to help students (and also graduates) meeting and communicating together, reinforcing and renewing their professional and social network (see Section 1.4.d).

## 2.7. Interaction between the EMJMD and non-educational actors in course implementation

**The contribution of non-educational actors** (including representatives from the business community - in the design of EMSHIP<sup>+</sup>) is the major role played by the **industrial SAB** (Annex A4) and has already been developed in many sections of this document. Composed of high level decision makers of leading European maritime companies, the SAB actively contributes to the **development of the programme** by providing internship to the students, short seminars on specific topics (Section 1.4.d), but also to **its design and assessment** by playing an active role in the **Quality Assurance**. In addition, the SAB provides some **funding opportunities** (Table 3.10) and job opportunities.

**Guest lecturers** coming from the business community give additional lectures and seminars, such as “*Principles of Management*” (at ULiège, M1) and “*Cost-benefit analysis and optimisation of business projects in marine industry*” (at ZUT, M2), promoting transversal and soft skills.

**Internship in industry** (Section 1.4.d) is an important part of the programme, providing soft skills and transversal abilities (Section 1.5.d); the master thesis is developed in close cooperation with industry and non-educational actors.

## 3. Quality of the project team and the cooperation arrangements

### 3.1. The fields of expertise of the partners/staff and how they are complementary and of added value for the EMSHIP<sup>+</sup> implementation. How cooperation agreements have been enhanced to meet EMSHIP<sup>+</sup> objectives.

#### a) Institutional expertise and professional experience of key staff of each partner and what are their strengths and added value for the implementation of EMSHIP<sup>+</sup> in its socio-economic environment

The EMSHIP<sup>+</sup> Consortium is extremely diversified and complementary, with staff having experience in many R&D projects (see hereafter “**Skills & Expertise**”, pages 46-54). In total, it includes 15 universities from all over the world (Fig. 1.4) and more than 25 industrial partners (Annex A4: SAB). The **EMSHIP<sup>+</sup> objectives** are listed at the beginning of Section 1 and in Section 1.1.a.

**ULiège** is the coordinator of the EMSHIP<sup>+</sup> programme. It is a State University of the French Community of Belgium and a comprehensive university (24,000 students) that includes the Faculty of Applied Sciences (2,000 students). ULiège takes part in several EMJMD and Joint Doctorates (as EMERALD, FAME, SUSCOS, MER, IDS Fun Mat, NANOFAR, ...). During the first year of EMSHIP<sup>+</sup>, courses in ship and offshore design are given by ANAST's staff (Naval Architecture Unit of University of Liege, [www.anast.ulg.ac.be](http://www.anast.ulg.ac.be)). Key staffs in charge of EMSHIP<sup>+</sup> au ULiège are Professors P. Rigo (coordinator of EMSHIP<sup>+</sup>) and A. Hage.

**ECN** (France), **URO** (Germany) and **ZUT** (Poland) are delivering their own Master diploma with ULiège that leads to three double Master degrees. Soon a joint degree (today under accreditation approval by ANECA) between **UPM** (Spain) and **ULiège** will also be proposed to students. During their second year, students are allocated to one of these 3 (4) partners corresponding to 3 (4) different specialisations. **ECN** courses are devoted to Hydrodynamics (from a theoretical, experimental and numerical point of view) for Ocean Eng., **URO** courses to Ocean Eng. and Ship Technology, **ZUT** courses to Advanced Ship and Offshore Structures, and **UPM** courses to Offshore Wind Energy.

Key staffs in charge of EMSHIP<sup>+</sup> programme are Professors L. Gentaz (local coordinator) and P. Ferrant for ECN, Professors P. Kaeding (local coordinator) and R. Bronsart for URO, Professors M. Taczala (local coordinator) and Z. Sekulski for ZUT. Moreover all these partners are in charge of the supervision of internships and master thesis of students they have enrolled for this 2<sup>nd</sup> year of studies. All these actors are complementary with minimum overlaps (Section 3.1.b).

Five other European universities are involved in the programme (see in “Skills & Expertise”, pages 46-54) and are members of the Consortium, which in total is composed of 9 universities. During the 2<sup>nd</sup> year, they have specific tasks in the academic process (Fig.1.3 in Section 1.1) by proposing and supervising internships coupled with master thesis. Most of them were already participating in the former EMSHIP. For EMSHIP<sup>+</sup>, their tasks and added values for implementation of the Master in socio-economic environment are (see details in Table 3.1):

- **UGAL** (University of Galati, Romania) with a specialization in Advanced Hydrodynamics in Ship Design (especially propulsion and manoeuvrability) led by Professors F. Pacuraru (local coordinator) and L. Domnisoru.
- **UNIGE** (University of Genoa, Italy) specialized in Sailing Yacht and Pleasure Motor Yacht represented by Professors D. Boote (local coordinator) and I. Ferrando.
- **ICAM** (Institut Catholique des Arts et Métiers, France), specialized in Composite Materials and Offshore Structures. Professor H. Le Sourne is local coordinator.
- **SOLENT** (Southampton Solent University, United Kingdom), a new partner, specialized in Small and Racing Crafts. The local coordinator is Professor J. B. Soupez.
- **UPM** (University Polytechnic of Madrid, Spain), new partner specialized in Offshore Wind Energy and having experience in entrepreneurship education. Professor Luis Ramón Núñez Rivas is local coordinator.

Other Universities (*Associated Partners*) are included in EMSHIP<sup>+</sup>. All of them are located outside of Europe (Fig 1.4) and they are our overseas representatives, being in charge of promotion and dissemination all over the world. They may welcome students for internships and propose scholars for courses in ULiège, ECN, URO, ZUT and soon to UPM. These universities are from Asia, North America, South America, Australia and Africa (Annex C).

In addition, WEGEMT, associated partner, is promoting EMSHIP<sup>+</sup> and contributes to its dissemination and visibility in the professional maritime sector.

Consortium and associated university strengths provide added values for the implementation of the Master in its socio-economic environment through the integration of industrial actors and the internships, allowing students to get acquainted with the **world of work**, a first social **professional experience** and also transversal knowledge about the maritime business world and **entrepreneurship**.

#### **b) EMSHIP<sup>+</sup> partners have worked together in previous international projects and these existing cooperation agreements between them have been enhanced in view of the EMSHIP<sup>+</sup> aims and objectives**

EMSHIP<sup>+</sup> partners are involved in major international associations, which are forums for the exchange of information between experts of different fields with as specific objectives: a) to make recommendations for improvement of procedures, design, production; b) to review research in progress; and c) to identify areas requiring future research.

For instance, **ULiège** (P. Rigo), **URO** (P. Kaeding), **ZUT** (Z. Sekulski), **UNIGE** (D. Boote) are members of the ISSC (International Ship and Offshore Structures Congress) dedicated to marine structural research, design and production. **ECN** (P. Ferrant), **UPM** (A. Souto Eglesias), **ULiège** (A. Hage), **UNIGE**, **OU** (Osaka), **PNU**, **ITU** and **UoM** are members of the ITTC (International Towing Tank Conference) dedicated to hydro-mechanical science. These associations allow EMSHIP<sup>+</sup> members to strengthen their links and to meet other representatives of their field of expertise. Historically, these links have facilitated the creation of the Consortium of the previous EMSHIP programme.

For many years the proximity between partners has been leading to various actions dedicated to research or teaching activity (see “Skills & Expertise”, pages 46-54):

- Several PhD theses in co-supervision have been started (some of them have been defended already) between ICAM, ULiège and ECN, leading to joint scientific papers in international journals (J. of Marine Structures...);
- URO and ZUT cooperate in the EU Projects as TRAIN LNG (training new competencies in LNG for cross-border growth) and Real Time Ferrying (EU Interregional Baltic Sea Region Project);
- Many invitations of guest lecturers for courses have been done: ICAM gave lectures at ECN, UNIGE lectures at URO, URO lectures at ZUT, SOLENT lectures at ULiège and many others in the frame of the former EMSHIP;
- UPM and ECN share activities within WEGEMT and ITTC;
- ULiège has provided technical assistance to USTO to develop their experimental facilities (towing tank);
- Exchange of students, teaching and administrative staff in the framework of Erasmus LLP and Erasmus+ Programmes including UNIGE students doing their master theses in ZUT;
- Collaborations between staff of different partners through research projects and ISSC activities have been undertaken: ULiège with PNU, UoM and Osaka, etc.

First the EMSHIP<sup>+</sup> Consortium has been strengthened with new Consortium partners (UPM, ICAM and SOLENT) to extend its field of expertise, to increase the number of industrial partners in the Advisory Board (more than 25), to give more possibilities of internships to students and provide more opportunities and specialisations to students.

There is also the Alumni group based on the network of EMSHIP graduates, active since 2013.

The common and integrated approach in the Consortium has been enhanced by the rationalisation of specific tasks (Fig. 1.3) and shared responsibilities between partners in terms of promotion, dissemination, intranet system and website, quality assessment and contacts with European or overseas academic and industrial partners (See Table 3.3).

Moreover the former programme has already been upgraded (Annex D4) and the new EMSHIP<sup>+</sup> programme started in Sept. 2017. In Sept. 2019 the program will welcome UPM Madrid to benefit from their experience in Offshore Wind Energy, first as partner involved in master thesis & internships, and soon with a joint Master degree with ULiège (Fig 1.2).

**c) Existing partnerships have been enriched with the inclusion of new academic partners, and this contributes to widening the joint programme across the EHEA**

Partnership of the former EMSHIP has been enriched by adding new partners to form the new EMSHIP<sup>+</sup>, see Table 3.1. These new partners are well integrated. For example, for the Sept 2018 intake, 2 students will do their internship and master theses with ICAM and 2 with SOLENT. Clearly, these new partners are enriching existing partnerships by proposing new fields of expertise for education and research (as UPM also), new contacts with other universities or companies, different and complementary background in ways of teaching, in relations with foreign students.

More globally these new partners with their new fields of expertise will allow the Consortium to be better equipped to meet its objective to help the society to fight the global warming by giving to students a scientific and technological education and bringing to companies young engineers able to respond to future challenges (floating OWT, water turbines).

**Table 3.1: New partners added to form the new EMSHIP<sup>+</sup>**

University	New partners added to form the new EMSHIP <sup>+</sup>
<b>UPM</b> (Spain)	Universidad Politecnica de Madrid brings a new expertise in the Consortium “Offshore Renewable Energy”. Formally UPM will welcome students for the 4 <sup>th</sup> semester to supervise internship and master thesis. But, as soon as the UPM-ULiège joint Master degree will be accredited by ANECA agency, EMSHIP <sup>+</sup> will propose to EACEA this new Joint degree, which will be a 4 <sup>th</sup> track (Figure 1.2).
<b>ICAM</b> (France)	ICAM is now a full member of the EMSHIP <sup>+</sup> Consortium. ICAM provides expertise in composite structures and composite materials design and recycling. ICAM has strong links with industry through its expertise: shipyards, engineering companies in naval architecture, classification societies and companies involved in development of wind generators. Since 2014, H. Le Sourn supervises internships and shares the Consortium responsibilities by managing the industrial partners (Fig 1.3).
<b>SOLENT</b> (UK)	A brand new partner, SOLENT provides its own expertise in small crafts and sailing yachts education and research. This partner has strong links with numerous industrial partners. The SOLENT local coordinator, J-B Soupez, gives lectures (Yacht Design) at ULiège to EMSHIP <sup>+</sup> students (Fig.1.2 - Section 1.1). Moreover SOLENT brings its expertise in innovative teaching methods (Section 1.5.c).
<b>UFRJ</b> (Brazil)	Federal University of Rio Janeiro proposes internships to students and scholars in the field of Ship and Offshore production. UFRJ is one of the new non-European associated academic partners in EMSHIP <sup>+</sup> . Each year some Brazilian students attend the EMSHIP programme, and Prof Caprace comes to ULiège to give some lectures in Ship Production.
<b>PNU</b> (South Korea)	Pusan National University (see Annex C) proposes internships in naval engineering and shipbuilding. This university is located in one of the most active countries in the world for marine industry and shipbuilding. Thus it is extremely important for EMSHIP <sup>+</sup> to have an academic partner close to the largest shipyards in the world. PNU-Kosori welcomes students for internship and proposes scholars.
<b>ITU</b> (Turkey)	Istanbul Technical University (see Annex C) proposes internships to students and scholars from this University have already given courses at ULiège. ITU has organized the EMSHIP week in 2016. It must be noticed that several Turkish students attended the EMSHIP programme these last years.

The visibility and attractiveness of the EMSHIP<sup>+</sup> will be reinforced with these new partners. EMSHIP<sup>+</sup> is a cluster of 9 EU universities offering several specializations (3 tracks, and soon 4), contributing to widening the programme across EHEA.

For their master thesis, students will have new opportunities to gain knowledge in very attractive and innovative fields proposed by SOLENT (development of foils reducing drag on sailing yachts), ICAM (composite materials for ships or blades of wind turbines, numerical methods to study ship-floating wind turbines collisions ...), ITU-Turkey (Computational Fluid Dynamics for ships) and UPM (Offshore wind turbines).

These new partners will also have a significant impact on the European Higher Education Area (EHEA):

- Providing young engineers and researchers with new scientific and technological tools, which will be essential to development and design of ships and renewable marine energy devices, adapted to the fight against the climate change and the global warming.
- Promoting innovative ways of teaching to provide students from all over the world with recorded lectures online.

**d) The Consortium designed the curriculum using the academic strengths of the individual partners**

EMSHIP<sup>+</sup> curriculum has been designed using the expertise of each partner in education related to Advanced Design of Ships and Offshore Structures, this means: Naval Architecture (including ship and offshore technology, ship and offshore structures, ship and offshore hydrodynamics) at ULiège during the 1<sup>st</sup> year of education, ship technology and ocean engineering for

URO, advanced lectures in ship and offshore structures for ZUT, hydrodynamics for naval and ocean engineering for ECN and offshore wind turbines for UPM (Figs 1.1 and 1.2).

The entire curriculum has been carefully planned by the Consortium to be well-structured and well balanced between the 1<sup>st</sup> year of education at ULiège where students must acquire all basics related to ship design, offshore structures, hydrodynamics, technology... and the 2<sup>nd</sup> year (URO, ZUT, ECN) where students gain wider experience in one of the fields and perform their internship and master thesis, with possible support of UPM, UGAL, UNIGE, ICAM and SOLENT, or one of the 7 overseas associated partners.

The programme is fully integrated as the lectures are given by the academic staff of the different partners and by the scholars from the other universities (associated partners and others), which participate in the educational process. Additional details about scholars are given in Table 3.2 (Section 3.1.e below) and Section 4.4.a.

Of course this high-level education makes use of:

- Experience of the former EMSHIP programme;
- Research expertise of partners: all lecturers, associated professors and professors giving lectures in the EMSHIP<sup>+</sup> have a strong research activity allowing lectures to be permanently enriched by progress in research;
- Strong links between partners allowing a highly integrated programme including academic aspects (Section 1.1);
- Meetings with industrial partners from SAB allowing the proposed EMSHIP<sup>+</sup> education programme to be adapted to needs and new trends of the marine and offshore industry.

As explained before, EMSHIP<sup>+</sup> reflects the expertise and the academic strengths of each partner (see Fig 1.2: EMSHIP<sup>+</sup> tracks and also Annex D4: Course Content.)

#### e) Added value of invited scholars/guest lecturers in the teaching part of the EMSHIP<sup>+</sup> programme

Scholars and industrial guest lecturers are invited to give courses in fields which are complementary to the Consortium university specialities. These lectures contribute to a multidisciplinary programme and to soft/transversal skills.

For example, the following courses can be given by scholars (see also Annex B3):

- Ship economy and recycling given by scholars from BUT (Bangladesh University of Technology) ;
- Ship economy and maritime transportation by a scholar from Varna University (Bulgaria);
- Aerodynamics and hydrodynamics for sailing yachts by a scholar from UoM or SOLENT;
- Ship Engines by a scholar from USTO;
- Entrepreneurship will be given by UPM at ULiège during a 2-day short course.

Scholars (from EMSHIP<sup>+</sup> associated partners and from other universities and companies) allow universities to offer students courses and conferences in fields different from their own academic specialities (Table 3.2). These scholars will deliver soft-skills learning actions (creation and management of enterprises) as well as teaching highlighting research problems and challenges from their own fields (e.g. case-studies, project due diligences). Experience from scholars shows that their talks are engaging and elucidating, and give students indispensable knowledge for their scientific education and culture.

**Table 3.2: Scholars from EMSHIP<sup>+</sup> Partners**

ULiège	Scholars from SOLENT (sailing yachts), UFRJ (production and optimization), UNIGE (motor yachts) and UPM (entrepreneurship), participated at the lectures offered by ULiège (60 ECTS).
ECN	Scholars & specialists from UoM and Osaka
ZUT	Scholars offering lectures in hydrodynamics from ITU and UGAL
URO	Scholars from PNU, and UNSW who will provide lectures on composite materials
UPM	Scholars from ICAM will give lecture on risk of ship impact on offshore wind farms

Exchanges between scholars and the academic teams are sources of mutual enrichment. Moreover, scholars are often giving additional conferences about their own research activities, which emphasize discussions and transverse skills with researchers of the university inviting them. In addition, methodologies for teaching and assessing the students are different from one country/university/lecturer to another. Knowledge of others practices is another source of added value for the academic team of the universities where scholars are invited.

All universities will be encouraged to develop joint publications with the students, based on their master theses.

### 3.2 Institutional commitment of each partner, roles and tasks in the EMSHIP<sup>+</sup> implementation, and working mechanisms of the governing bodies and management tools in place

#### a) The institutional commitment of the Consortium to the joint delivery of the programme

Institutional commitment is guaranteed by 3 double degree agreements (and soon one joint degree) and the overarching Consortium Agreement signed by the legal representatives of the Consortium Universities, which certifies the commitment at institutional level of the participating universities to collaborate for the implementation of EMSHIP<sup>+</sup>.

The 1<sup>st</sup> cohort of EMSHIP<sup>+</sup> has been launched in Sept 2017 with 8 self-funded students. This clearly shows that the Consortium academic partners (see Fig 1.4) involved in EMSHIP<sup>+</sup> double degrees are totally committed and fully support the programme as presented in Fig. 1.3 (tracks) and Fig. 2.3 (mobility). All the Consortium Universities fully and automatically recognize grades, learning outcomes and ECTS mutually (as defined in the Consortium Agreement).

Students will be awarded by a double (*or joint*) Master degree and a joint diploma supplement. This double degree consists of two independent Master degrees, awarded by ULiège and by ECN, URO or ZUT (*or soon by a joint degree with UPM*). These degrees are listed in Section 1.2.a and Annex D.

Each Master degree presented above is accredited in its own country by national authorities and laws. Moreover, the Consortium Agreement and the double degree agreements between ULiège and ECN, ULiège and URO, ULiège and ZUT are already available (Annex D) and ensure mutual recognition of the different diploma delivered to the graduates. The joint degree agreement between UPM and ULiège is ready, waiting for positive accreditation by ANECA (Spanish accreditation agency) in late 2019.

#### **b) Academic, administrative, and financial rules and procedures related to the implementation and monitoring**

The main rules and procedures applicable for the EMSHIP<sup>+</sup> can be found in the Consortium Agreement and in double degree agreements.

→**Academic rules and procedures:** the main academic rules are:

- the student mobility scheme (Fig. 1.1, and details in Annex B4); starting by ULiège for the 1<sup>st</sup> year, followed, for the 2<sup>nd</sup> year, by a semester at ECN, URO or ZUT (and soon UPM) and then a 3<sup>rd</sup> mobility for the internship and master thesis with the support of UNIGE, UGAL, ICAM and SOLENT;
  - the student admission process to select the best candidates (Section 3.3);
  - all the assessment and deliberation procedures during two years of education in the programme (Section 3.3);
  - the procedure to help the students in their selection of their mobility plans and internships and the degree delivery.
- It has been checked that these rules and procedures comply with the academic regulations of each university, which has to assess studies and performances of students. Moreover, student's rights and duties (Annexes B4 and F) and quality assurance standards and procedures have been set (Section 2.2.b).

→**Administrative rules and procedures:** from the administrative point of view, the organization and operating rules of the Consortium, and the MMC have been carefully defined (Annex E and Fig. 1.3).

The MMC, the main assembly of EMSHIP<sup>+</sup>, is in charge of all the academic, financial, administrative aspects, voting procedure, etc. Its role and responsibilities are defined in the Consortium Agreement.

For instance, it is agreed that the Consortium partners will have the following number of votes (depending of their role): 3 votes each for ULiège-URO-ZUT-ECN and 1 vote each for UPM- UGAL-UNIGE-ICAM-SOLENT. In case of balance, the vote of the Coordinator is decisive. All administrative entities defined for the optimal operation of the EMSHIP<sup>+</sup> are defined in the Consortium Agreement.

The Master Administrative Coordinator (located at ULiège) is responsible for managing the programme at an inter-university level under the supervision of the Master Coordinator.

→**Financial rules and procedures:** the budget has been designed in order to balance all expenses - including tuition fees of each university involved into the 2-year programme, which are defined by each university local authorities (Table 3.5). The procedure is detailed in Section 3.4.e.

The management and use of the EU lump sum for the programme operation has been discussed (Section 3.4.c) and validated by the Consortium and is detailed in the Consortium Agreement.

Practically, all available funds (including EU lump sum and participation costs for students) will be centralized, managed and redistributed by the Coordinator University- under the supervision of the MMC.

#### **c) Roles and task definitions of the core partners and associated partners in the Consortium. Distribution of duties and tasks among the partners.**

During the preparation of the EMSHIP<sup>+</sup> concrete tasks concerning practical aspects of the programme operation have been identified, defined and shared between Consortium Universities (Table 3.3, Fig. 1.3 and Annex B1: Jointness).

**Table 3.3: The tasks shared between Consortium Universities**

<b>Universities</b>	<b>Tasks description of the Partners</b>
ULiège	The EMSHIP <sup>+</sup> website and promotion of the programme through internet and social networks (action will be done in collaboration with the Alumni team); coordination, finance, contacts with associates ...
ECN	Promotion & Marketing (conception, printing and dissemination of promotion materials, of flyers, posters ...); promotion of the programme in international student fairs. Master thesis and internship coordination.
URO	The Learning Management System, communication infrastructures, web services, administrative support.
ZUT	The relations and actions in relation with the Alumni and EMSHIP <sup>+</sup> Alumni Team. Outreach of EU associated partners. Induction in Maritime world and regulations: IMO, SOLAS ...
UPM	Induction course: Entrepreneurship, Maritime business, Renewable Marine Energy;
UGAL	Quality assessment: editing, launching and analysing the quality surveys that students fill in after each semester to evaluate efficiency and performance of the programme.
UNIGE	Contacts with industry for internship and job placement

ICAM	Contacts with SAB members and outreach of overseas associated partners
SOLENT	Communication and innovative education methods: online lectures, POD, You Tube...
Inter. Partners	Promotion of the EMSHIP <sup>+</sup> programme, propositions of internships to students and scholars.

A shared task (at Consortium level) is the organisation of the EMSHIP<sup>+</sup> week. Each year, we have a different location and therefore a specific local coordinator. Each partner will have their turn (also the associated partners if they wish).

#### **d) Management bodies and working mechanisms for effective project implementation and performance monitoring and sharing of information among the participating universities**

Details about the EMSHIP<sup>+</sup> management bodies are listed in Section 3.2.b. Each partner contributes to the implementation of the project under the supervision of the Master coordinator. The highly integrated operation and management of the Consortium ensures a good efficiency of this implementation. If a harsh problem arises, the Master Coordinator organises an exceptional meeting of the EMSHIP<sup>+</sup> MMC (possibly using video conference).

Entities and procedures have been designed for the monitoring of the project implementation and performance, such as:

- Meetings with industrials to assess the relevance of the education with respect to the industrial needs and market trends;
- Participation of students and the Alumni in the MMC meetings;
- Student surveys (Quality Assessment, each semester) from which correction measures (as soft skills to develop, updated promotion policy...) can be identified to improve the project implementation;
- Regular contacts by Skype and 2 annual MMC meetings (in fall during EMSHIP<sup>+</sup> week and in spring) for project coordination (internship selection, student assessment, deliberation...)
- A common online folder to drop topics of internships proposed by partner universities and industrial partners from SAB. This folder is shared between coordinator and local supervisors of 2<sup>nd</sup> year universities (URO, ZUT, ECN and soon UPM). Each local supervisor selects topics of internships relevant to his programme and proposes them to his students.

#### **e) Students are represented in the management structures**

Two students' representatives and two Alumni representatives (elected by their own group respectively) will be invited to the EMSHIP<sup>+</sup> MMC meetings. They will be able to vote on specific issues defined by the MMC such as organization of events (EMSHIP<sup>+</sup> week), exam planning, Alumni issues... and even proposals of new seminars and visits.

Graduates are involved in the promotion and the dissemination of the EMSHIP<sup>+</sup> programme through the Alumni group in collaboration with ZUT staff. "*After work sessions*" have been organized already and will be organized in the future to encourage links between present and former students.

### **3.3 Joint criteria, principles and requirements for student application, selection and admission requirements, student examination and performance evaluation**

#### **a) Student application, selection and admission criteria and the related procedures (included in the Consortium agreement). Mechanisms for performance assessments and Common methods for examination and thesis defence.**

**Student application and Student selection:** the student application will be done online using the EMSHIP<sup>+</sup> website: [www.emship.eu](http://www.emship.eu) (see Annex B4: Admission procedure). A full transparent and fair decision procedure for selection has been implemented (see Section 2.4.a).

**Admission criteria:** students with a Bachelor degree (with a minimum of 180 ECTS and a 3-year programme) in the relevant fields (Mechanical Engineering or Naval Architecture), or its equivalent, can apply for admission. Candidates will have to justify some prerequisites (that means minimum fundamental knowledge) in solid mechanics, materials or fluid mechanics and demonstrate basic programming skills (Annex B4).

As all the courses will be taught in English (this is a pre-requisite), students with a low level will not be eligible for the EMSHIP<sup>+</sup>. Non-native English speakers must have reached the "**European Standard B2**" English level. They have to show a TOEFL (or equivalent) English certificate. In principle, a minimum level of 550 and 213 points is required for the TOEFL and Computerized TOEFL, respectively. An interview will be organised by the coordinator (remotely) to validate the student's English ability at oral understanding.

Examinations and knowledge assessment are organized for each course of EMSHIP<sup>+</sup> during the semester and will be based on different formats: written exams with open questions or Multiple Choice Questions (MCQ), oral exams, reports of lab work and project work (see also info in Section 2.5.a). The rules for verification of the learning outcomes achieved by the students, evaluation of the projects, examination and defence of the theses will be integrated.

The partners may use their own grading system internally, but all results/grades are translated into the **common European Credit Transfer and Accumulation System (ECTS)** (see Table 2.1: **Table of grade conversion**). Grades and marks will be converted using the **EGRACONS** system ([Grading Tables for Online Grade Conversion Tool - http://egracons.eu](http://egracons.eu)). This online grade conversion tool is available to universities from all over Europe.

Students' performances are monitored globally by the coordinator (after each semester) and locally at each university during the semester by regular assessments (scheduled in advance), which could be group presentation on projects; individual homework and group reports. This is important in order to identify as soon as possible a student having problems with specific lectures in order to provide specific assistance (such as remediation class).

**Validation of 1<sup>st</sup> year (M1 at ULiège)** – see Annex B4 for more details:

At the end of the 1<sup>st</sup> year a joint deliberation between the Consortium Universities and ULiège is organized and students who have obtained 60 ECTS in ULiège are accepted in M2 at ECN, URO or ZUT. A student who has failed courses is authorized to have a retake exam in late August (this is a student's right). If he succeeds, he is accepted in M2. If not, he may restart, without guaranty of keeping his scholarship (but keeping the granted ECTS). Under special circumstances, a student who did

not obtain 60 ECTS after retaking exams can be authorized to go to M2 to ECN, URO or ZUT (see more details in section 2.5.a).

### Selection of students for 2<sup>nd</sup> year (M2 at ECN, URO or ZUT):

The MMC has defined the rules prevailing for the distribution of students among the Consortium Universities, in the closest possible correspondence with their wishes when joining the Master. The student allocation between ECN, URO, ZUT (and UPM in the future) for the 2<sup>nd</sup> year (M2) is decided in April before the end of the 1<sup>st</sup> year by the EMJMD.

This allocation is based on following steps (see Fig 2.3).

- In February, the MMC informs students about the maximum number of students that can go to ECN, URO and ZUT
- Students express their wishes by ranking the possible locations and provide a letter of motivation
- In April, students have an interview with a selection board composed of representatives of academic teams
- Late April, the MMC informs the students of its decision, made on the basis of students' wishes, and if necessary their performance during the interview and their ranking during the 1<sup>st</sup> year.

### Organization of Internship and Master Thesis (Annex B4):

The internship and master thesis are performed under the supervision of the university where the student is registered for the 2<sup>nd</sup> year (ECN, URO or ZUT; UPM in the future), in collaboration with UGAL, UNIGE, ICAM and SOLENT and a company from marine, offshore or maritime sectors and associated universities. The total duration is about 5 months.

During the 1<sup>st</sup> semester of the 2<sup>nd</sup> year (Fig. 2.3), the students receive master thesis proposals from all partners of the EMSHIP<sup>+</sup> Consortium (universities and industrials from SAB). In December, a preliminary selection for the distribution of the master thesis subjects is performed by the MMC, based on students' wishes. A final validation after students' and industrial partners' feedbacks occurs early January.

Each master thesis is assessed by a group of at least 3 professors (the supervisor, a prof. from the local university (2<sup>nd</sup> year university- M2), and a prof. from another EMSHIP<sup>+</sup> Consortium University) as well as the industrial supervisor.

The local records are all transferred by the 2<sup>nd</sup> year universities (M2) to the EMSHIP<sup>+</sup> coordinator. Then, there is joint deliberation between the partners (including a deliberation report signed by all EMSHIP<sup>+</sup> partners). In case of problem (e.g. a student who is just below acceptance criteria), a meeting is organized to consider the case with the involved partners (for the benefit of the student). Additional reviewer may also be involved to support the decision.

The master theses will be written according to the EMSHIP<sup>+</sup> standards and editorial guidelines.

### Thesis defence and validation of year in M2:

All master thesis defences are organized locally by 2<sup>nd</sup> year universities. For each student, external reviewers (from one of the other universities and from a SAB member) are in charge of assessing the quality of the thesis and of authorizing the defence. The master thesis evaluation is based on the defence itself, the reviewers' reports and the quality of the written document, and finally on a joint deliberation. The final evaluation is composed of the grades from the company supervisor (25%), university supervisor (50%) and external supervisor selected in the Consortium to guarantee fairness (25%).

If the global evaluation is positive, the 30 ECTS devoted to the master thesis are granted to the student. In such a case the 2<sup>nd</sup> year is validated and the student will be graduated by both involved universities (conferring the double/joint degree). The lecturers from other universities will also be invited to take part in the defence remotely e.g. via Skype.

Each year, one EMSHIP<sup>+</sup> professor (and a substitute) elected by the EMSHIP<sup>+</sup> MMC will supervise the master thesis and internship assessment. She/he will centralise the records and assessments from M2 universities (ECN, URO and ZUT), compare the thesis and assessment, and guarantee equivalent evaluation.

### Graduation ceremony:

URO, ZUT and ECN are organizing a local graduation ceremony for students hosted in their university during the 2<sup>nd</sup> year. A more ceremonial graduation, with all students, is then organized at ULiège in October (with all local students engineers graduating that year); alumni and partner academic authorities are invited.

## 3.4 Student participation costs, and description on how the financial resources including complementary funding will be mobilised, allocated and managed within the partnership.

### a) Budget of the Consortium's estimated costs and income when running the EMSHIP<sup>+</sup> programme (based on a financial "needs analysis"), and justification of the anticipated student participation costs.

The EMSHIP<sup>+</sup> EMJMD student participation costs requested to EU is 8.5 k€/year for Non-EU students and 4.5 k€/year for EU students (including 0.5k€/y for health insurance). This EU financial support is required to cover the mandatory expenses to perform the EMSHIP<sup>+</sup> educational and transversal activities (Table 3.4).

The financial results of the **need analysis** are given in Table 3.4. It shows that the costs (8.1 and 5.3 k€/y) are globally in balance with the EMJMD participation costs (8.5 and 4.5k€/y).

Table 3.4: The estimated costs of the Consortium per student	Needs per EU student	Needs per NON-EU student
EMSHIP <sup>+</sup> management: 30-40k€ for the Master Administrative Coordination, which includes a part time job (for the management), and the redistribution to partners (see	2.00 k€/y	2.00 k€/y

Items I.3 and I.4 of Table 3.8). Considering 15-20 EMJMD students/cohort, we obtain 2k€/student-year.		
University tuition fees (TF) are due to each university hosting EU and non-EU students in 1 <sup>st</sup> or 2 <sup>nd</sup> year according to their respective regulations and national legislations. The TF depends on local costs for education, computing facilities, study space, international relations office, language training, help for accommodation, visas and insurance, etc. For the next EMSHIP <sup>+</sup> intake (Sept 2019) the university tuition fees (per year), to the best of our knowledge considering the frequent evolutions of national regulations on that topic, are given in Table 3.5. Averages of 0.80 k€/y and 3.60 k€/y are considered.	0.80 k€/y	3.60 k€/y (see Table 3.5)  (will be 4.00 k€/y with UPM)
Lecturing fees: invited lecturers and scholars (10k€/y – see Table 3.9), preparation of specific course material, lab work material, software licenses, etc.	1.00 k€/y	1.00 k€/y
Annual EMSHIP <sup>+</sup> week, technical visits, etc.	1.00 k€/y	1.00 k€/y
Health insurance	0.50 k€/y	0.50 k€/y
<b>TOTAL (estimated expenses)</b>	<b>5.30 k€/y</b>	<b>8.10 k€/y</b>
<b>compared to the amount requested as EU participation costs</b>	<b>4.50 k€/y</b>	<b>8.50 k€/y</b>

Table 3.5: University Registration fees (per year)

Universities	Fees for a non-EU student	Fees for an EU student
ULiège (M1)	4.175 k€	0.835 k€
ECN & UPM (M2)	6.00 k€	1.50 k €
URO & ZUT(M2)	1.50 k€	0.4 k€
<b>Average</b>	<b>3.60 k€/y</b> 4k€/y with UPM	<b>0.80 k€/y</b> 0.9k€/y with UPM

Table 3.6: Expected students (25 students/year)

EMJMD Funded students		Self-Funded (SF) Students (with or without scholarship)		Total Students
		Full Self-funded	With scholarship (or TF waived)	
<b>EU</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>7</b>
<b>NON EU</b>	<b>11</b>	<b>5</b>	<b>2</b>	<b>18</b>
<b>TOTAL</b>	<b>15</b>	<b>10</b>		<b>25</b>

EMSHIP<sup>+</sup> **Incomes** are listed in Table 3.7 and the **Expenses** in Table 3.8, considering 25 students/cohort (7 EU and 18 Non-EU), including 15 EMJMD students (Table 3.6).

Table 3.7: EMSHIP<sup>+</sup> INCOMES (under EMJMD funding period)

<b>I) TOTAL INCOMES for 25 students (15 EMJMD and 10 full self-funded)</b> <b>In total 7 EU and 18 non EU students</b> (see details in Table 3.6)	<b>261 k€/y and per cohort</b>
I.1) EMSHIP <sup>+</sup> participation costs (given by EU) for the management of the Consortium and scholars (50k€ lump sum per cohort (2 years) ⇒ 25k per year) - see Section 3.4.c	25 k€ <b>EU FUNDED</b>
I.2) EMSHIP <sup>+</sup> participation costs given by EU to EMJMD students (health insurance excluded) for 15 students (4 EU x 4 k€/y and 11 Non-EU x 8 k€/y). NB: <i>EU fund for student mobility is not included in this Table as directly redistributed to students</i>	104 k€ <b>EU FUNDED</b>
I.3) Participation fees from the self-funded students paying full tuition fees (TF): 6 students (1 EU x 4 k€/y and 5 Non-EU x 8 k€/y)	44 k€ <b>SF students</b>
I.4) Student scholarships provided by Consortium universities, ULiège (36k€), URO (15k€) and ZUT (15k€) - (see Table 3.10)	66k€ <b>EMSHIP<sup>+</sup> Fund</b>
I.5) Student scholarships by indust. partners: COTECMAR, OMCS (50% of 44k€) (Table 3.10) ;	22k€ <b>EMSHIP<sup>+</sup> Fund</b>
I.6) Punctual support by universities and industrial partners for travel expenses of students to the EMSHIP <sup>+</sup> week, attendances to conference; supports directly wired to students (5-10 k€/y)	NA

Table 3.8: EMSHIP<sup>+</sup> EXPENSES (under EMJMD funding period)

<b>E) TOTAL EXPENSES for 25 students (15 EMJMD and 10 full self-funded)</b> <b>In total 7 EU and 18 non EU students</b> (see details in Table 3.6)	<b>257.4 k€/y per cohort</b>
E.1) Cost of the <u>part time job (per year)</u> for the Programme administrative management and support to educational programme (for each intake!) ⇒ 30k€/intake /2 years = 15 k€/y	15 k€/y
E.2) Tuition Fees redistributed to the universities (involved in the double degree) 18 Non EU x 3.6 k€/y + 7 EU x 0.8 k€/y (see Table 3.5)	70.4 k€/y
E.3) <u>Redistribution to Partners</u> (see Sect. 3.4.e. and Annex E: Consortium Agreement). This redistribution covers the overhead costs of the 9 Consortium universities (ULiège, ECN, URO, ZUT, UPM, UGAL, UNIGE, ICAM, and SOLENT). This includes the travel expenses for MMC meetings, EMSHIP <sup>+</sup> week, and other EMSHIP <sup>+</sup> meetings. In average, 4 k€/y x 9 partners = 36 k€/year.	36 k€/y
E.4) <u>The travel expenses of the 8 associated partners</u> (Osaka, UoM, UFRJ, etc.) having no redistribution to cover their participation at MMC, EMSHIP <sup>+</sup> week and other events;	10 k€/y

E.5) <u>Scholars</u> : 20k€/cohort for 2 years (50% each year) - see Section 3.4.c	10 k€/y
E.6) <u>Technical visits and seminars</u> given by invited guest (industrials...).	10 k€/y
E.7) <u>Final Diploma Ceremony</u> including the presentation by the students;	3 k€/y
E.8) <u>EMSHIP<sup>+</sup> week organisation costs</u> : we plan to cover all the students' expenses (accommodation, travel, and food) with the Consortium budget and the sponsors. We need 10k€ for renting rooms, catering and a part of the student accommodation and travel costs, for 50 students, 20 SAB members and 15 profs.	10 k€/y
E.9) Maintenance of the <u>EMSHIP<sup>+</sup> website</u> and the LMS (Intranet);	5 k€/y
E.10) <u>Financial support for non EMJMD scholarship holders</u> – Table 3.10. The Consortium will invite students to join the programme due to special circumstances (poor country and students with “social” or “physical” reasons). It can be tuition fees waiving and/or industrial scholarship allocated by the MMC on an individual basis. See Table 3.7 (Items I.4 and I.5): 66+ 22 k€= 88 k€/y	88 k€/y

The Consortium (MMC), under the supervision of the Master coordinator, is in charge of keeping the balance between expenses and incomes (about 257 - 261k€/year - see Tables 3.7 and 3.8). About 50% of this amount (133k€ - Items I.1 and I.2 of Table 3.6) will be funded by EU and the other 50% funded by the partner universities and by external sources as industrial partners and the self-funded students.

To reach such balanced budget (Tables 3.7 and 3.8), the participations costs (Table 3.4) should be 8.5 k€/y for non-EU students and 4.5 k€/y for EU students (considering 0.5k€/y as average for health insurance on 2019-2023).

These costs are the same whatever the mobility path chosen by the students and the selected university for the 2<sup>nd</sup> year (ECN, URO, ZUT, and latter UPM). Partial waiver of university tuition fees can be decided by the MMC on an individual basis. All students will be exempted of any other fees at the universities they will join.

### **b) Each partner contributes financially to the implementation of the joint Master, especially when the anticipated costs are higher than the maximum EU contribution**

**The core partners (ULiège, ECN, URO and ZUT) will contribute directly in cash (about 66k€/year, see Table 3.10), but also indirectly by:**

- academic life (lectures, lab works, projects, mandatory or optional language classes, visits of shipyards or others industrial sites, examinations), organized by local teaching teams,
- facilities provided to students (including laboratory costs as the technicians are assisting students to realize physical model of ships to be tested in towing tank, preparing experimental set-up and measuring devices for lab works (ULiège, ECN, URO and soon UPM),
- the cost of staff (students' administration and international relations departments) assisting the students before and upon their arrival for visa, registration, accommodation and for everyday life.

**In average, UPM, ICAM, SOLENT, UGAL and UNIGE (associated partners) will contribute each for an equivalent of 18k€/year, which corresponds to 5 months of supervision (1 day per week) of 2 or 3 EMSHIP<sup>+</sup> students doing their master thesis with them, including salary and laboratory overheads. During the funding period, they will receive only 4k€/year (item E.3 in Table 3.8), which should also cover their travel expenses. This amount will be reduced to less than 3 k€ after the funding period (Table 4.1, Section 4.1.a).**

All these activities are necessary for the implementation of the EMSHIP<sup>+</sup> programme and are possible through work and efforts of many different people (administrative staff, academic staff ...). The real financial cost per student of these activities is difficult to assess but is much higher than the budget calculation considered here.

Nevertheless, each partner university has proposed a reasonable amount of tuition fees within the framework of the EMSHIP<sup>+</sup> program while respecting its national and/or internal regulations (Table 3.5).

Today, the costs estimated by the EMSHIP<sup>+</sup> MMC for implementation of the joint Master will be balanced thanks to the EU contributions (8.5k€ and 4.5k€/student). Later, to be sustainable, the EMSHIP<sup>+</sup> Consortium will continue to prospect for supplementary (non-EU) funds as it did during the last two years (Fig 4.2). These funds will be found through scholarships proposed by private companies and industrial partners (from SAB among others) and by each university coming from internal, local or national systems (see Table 4.1).

If difficulties to ensure financial balance of the EMSHIP<sup>+</sup> programme would arise, the MMC could take extraordinary measures, for example modification of the rules for redistribution of the funds in the Consortium (Section 3.4.e and Annex E: Consortium Agreement) to keep a financial balance between incomes and outcomes and overcome this situation.

In conclusion, there are different ways for the EMSHIP<sup>+</sup> Consortium to balance a potential future increase of costs due to the implementation of the joint Master and for sure, to secure the sustainability of the programme.

### **c) The EU lump sum is used for Consortium management and for the involvement of scholars and guest lecturers**

**Management costs:** A 1<sup>st</sup> part of the EU lump sum (30 k€) is dedicated to the EMSHIP<sup>+</sup> Master Administrative Coordinator (half-time position) and to the EMSHIP<sup>+</sup> secretariat located at the coordinator university (ULiège). This secretariat is in charge of helping the Master Coordinator and all partners for various tasks:

- Support for students' selection by collecting all documents for selection, registration and arrival (Belgium - 1<sup>st</sup> year),
- Administrative work for students' admission documents (including visas, accommodation, banking procedures, ...)
- Logistics of EMSHIP<sup>+</sup> week,

- Communication relay with students along their 2-year participation in EMSHIP<sup>+</sup>,
- Annual reporting with EACEA and financial management of the EMSHIP<sup>+</sup> budget and justification.

The 2<sup>nd</sup> part concerns the **scholars and Guest lecturers** (Table 3.9): an amount of 20k€ is dedicated to travels and accommodation expenses of the scholars invited during the first three semesters of the programme.

The Consortium plans a minimum of 6 scholars/intake (and up to 10 if possible). Typically 50% of scholars will come for 2 weeks and the others for 1 week.

**Table 3.9: Scholars**

Scholar Types	Financial Supports	Total amount per scholar (average)
<b>EU Scholars</b>	300-400 €/travel and 100€/day	1.1 k€ for 1 week or 1.8 k€ for 2 weeks
<b>NON EU scholars</b>	700-1000€/travel and 100€/day	1.7 k€ for 1 week or 2.4 k€ for 2 weeks
<b>Guest lecturers</b>	short seminars (1 or 2 days)	0.3 -0.5 k€ for hotel and travel

There is a **clear procedure to identify and then recruit scholars** and later evaluate their lectures and support:

- On the EMSHIP<sup>+</sup> website, an online call formulating expectations on the subjects for invited lecturers will be accessible all the year (concerning the next academic year);
- Candidates will register electronically by sending motivations, CV and details about the targeted lectures and their education methodology (table of content will be welcome);
- The most suitable candidates will be selected by the EMSHIP<sup>+</sup> committee appointed by MMC,
- One EMSHIP<sup>+</sup> partner professor will supervise each scholar to target best integration. Discussion with the scholar will be done before his/her lectures to avoid overlaps with courses of the hosting university. The university hosting a scholar will give opportunities of future research collaborations and meeting local staffs/researchers;
- After, students will assess classes and professors (end of semester) with the EMSHIP<sup>+</sup> LMS survey, done anonymously.
- Each scholar or lecturer will submit a written report/note and his/her recommendation to improve the programme.

#### d) How will complementary funding (from non-EU sources) be mobilised?

Complementary funding (Table 3.10) will be mobilised in cash but also in nature (supports given free by partners).

**Table 3.10: Complementary funding (from non-EU sources)**

<u>Funding mobilised in cash</u>	<u>TOTAL</u>	<b>104k€/y</b>
Industrials send their staff/engineers to EMSHIP <sup>+</sup> for a high education programme (as COTECMAR from Columbia, which funds full scholarships and full TF - 36k€/ student) or are sponsoring some specific master thesis (as OMCS from Panama) supporting the student TF (8k€). This means 44k€/cohort		22k€/y
Industrial SAB member are encouraged to offer scholarships for self-funded students (especially during their internship). This means 400€/month x 4 months for 50% of the internships (10 x 1.6k€)		16k€/y
University partners propose partial or full scholarships coming from internal organisation (like foundations). ULiège awards one NON-EU self-funded student a scholarship of 850€/month (+ travel) and one EU self-funded student a scholarship of 500€/month (+travel) for a total of 36k€/year.		36k€/y
Similarly URO and ZUT will give scholarships (15k€ each) for Non-EU students for a total of 30k€/year (distributed to students through scholarship, covering partially TF and/or living expenses).		30k€/y
<u>Funding mobilised in nature</u>	<u>TOTAL</u>	<b>&gt; 390k€/y</b>
The contribution of industrial companies can also be evaluated via: place of work for trainees, media, cost of taking care of the students, use of materials, use of tools including software, security measures, ... This represents about 10-15k€/ company x 30 students;		Equivalent to >300k€/year
In average, UPM, ICAM, SOLENT, UGAL and UNIGE contribute each for an equivalent of 18k€/year, which corresponds to 5 months of supervision of 2 or 3 EMSHIP <sup>+</sup> students (1 day/week), including salary and laboratory overheads.		Equivalent to 90 k€/y

#### e) How will the funds be allocated within the Consortium, and how will this be endorsed at Consortium level?

##### **Allocation of the available funds in the Consortium:**

A part of the funds available for the EMSHIP<sup>+</sup> management will be redistributed to all partners according to the general rules defined in the Consortium agreement. The allocation is the following:

- a fixed amount of 30-40k€/y (for the 2 running cohorts) will be allocated for the **Consortium management expenses**, and 20k€ **will be allocated to the scholars**.
- About 10k€/y are allocated for **EMSHIP<sup>+</sup> week** (Item E.8 in Table 3.8) **and** 10k€/y for **technical visits**(Item E.6);
- Per non-EU Student, a “*Minimum Guaranteed Fund*” will be allocated to ECN, ZUT, URO, ULiège (*and later to UPM*) to manage locally their Education Program (EMSHIP<sup>+</sup>). This amount is calculated per non-EU student studying at the concerned university (see Table 3.8, items E.3 and E.4.)

It is agreed that this amount will be the higher of these 2 amounts:

- The “legal registration fees for non-EU student” (Table 3.5): the core members (ECN, ZUT, URO and ULiège) will receive the legal registration fees fixed by their authorities. These amounts may be updated each year, at least 12 months in advance by the MMC; or
- A support fund calculated as 1.5k€/y x number of EMSHIP<sup>+</sup> non-EU students at the concerned university. This

amount may be revised annually by the MMC.

- **For the EU Students:** Each university will receive its “legal registration fees for EU student” fixed by their authorities (amounts to be updated each year, at least 12 months in advance). Concerning these EU students, there is no “*Minimum Guaranteed Fund*” for the core member universities.
- **The remaining part will be distributed** between partners: 12.5% each for ULiège, ECN, URO and ZUT; 8% each for UPM, UGAL, UNIGE, ICAM and SOLENT; and 10% of this budget will be used by the Consortium to support expenses of the other associated partners (international universities), additional scholars (visiting professors), student scholarships and support to Alumni EMSHIP<sup>+</sup> group.
- In the case of insufficient budget, all the fees (including the Consortium management expenses and the redistribution to partners) will be reduced, based on financial solidarity between partners of the Consortium, if required. Temporary rules will be discussed and decided by the MMC to overcome such situation.

These rules have been agreed upon by all partners and are included in the Consortium Agreement.

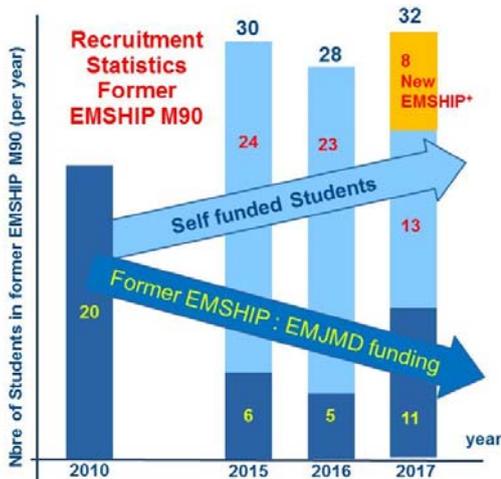
**Financial management of the EMJMD grant:** the funds will be centralized and managed by the Coordinating University and especially by the Master Administrative Coordinator under supervision of the Master Coordinator and in coordination with the international office and financial services of ULiège. Redistribution of amounts to the Consortium and Associated Universities will be done by bank transfer to the financial services of each university following rules defined above.

**Scholarship payment procedure:** the payment procedure to students is detailed in the Student Agreement (Annex F). Students will open a bank account and will provide the full details to ULiège (students’ contact at the International Office).

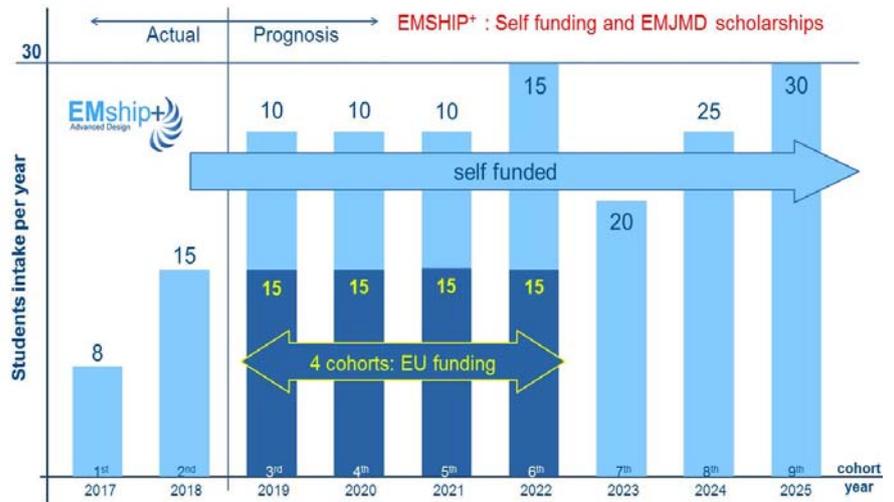
## 4. IMPACT and DISSEMINATION

### 4.1. Mid/long-term development/sustainability strategy -- Projections beyond the EU funding period -- Ways to mobilise other funding sources for scholarships and self-funded students

The EMSHIP<sup>+</sup> proposal is built on the former EMSHIP programme, which was attracting yearly more than 10 self-funded students from different regions of the world (Fig 4.1 and Annex A1: Statistics). Due to admission criteria set on Bachelor level instead of Master, we are confident that EMSHIP<sup>+</sup> will also attract enough excellent students using **scholarships from EMSHIP<sup>+</sup> universities and financial supports from industrial partners** - see Table 3.10.



**Fig 4.1: Statistics of former EMSHIP programme** (intakes 2015-2017) with Co-Funding EU scheme (60 Self-funding students and 22 EACEA funded students).



**Fig 4.2: Statistics of new EMSHIP<sup>+</sup> (2017 and 2018 cohorts) and projection after the EU funding period (long term)**

Fig 4.1 shows clearly that the Consortium succeeded to mobilize significant funds from other (non-EU) sources, particularly during the last 3 cohorts, which were funded by EU in the framework of a shared funding principle.

Fig 4.2 shows the recruitment projections for the medium and long term.

During the 1<sup>st</sup> and 2<sup>nd</sup> cohorts of the new EMSHIP<sup>+</sup> program, the following amounts have been collected:

- 1<sup>st</sup> cohort - 8 students: 51k€ have been allocated to students (as scholarships);
- 2<sup>nd</sup> cohort - 15 students: 85k€ have been allocated to students (as scholarships).

Table 4.1 presents the projections of the budget after the funding period, which should be compared to the budget during the funding period (Tables 3.7 and 3.8). The budget presented in Table 4.1 is a conservative budget, for instance in our capacity to attract students having the financial capability to pay the full registration fees. **We are confident to reach a higher level after the “boost” of the EU funding period,** but the presented projection already shows clearly our potential to be sustainable after the EU funding period.

**Table 4.1: Budget after the EU funding period (Projection)**

<b>INCOME after the EU funding period based on 15 self-funded students (per intake and per year)</b>	
1) Registration Fees from self-funded students	<b>100 k€/year</b> coming from 10 NON EU students/y x 8k€/y and 5 EU students/y x 4k€/y
2) Student scholarships funded by ULiège, ECN, URO and ZUT (and later UPM)	<b>33 k€/year</b> (66k€/cohort - see details in Table 3.10)
3) Industrial scholarships for students/employees	<b>22k€/year</b> COTECMAR: 18k€/y and OMCS: 4k€/y (or 44k€/cohort)
4) Donation from SAB members	<b>20k€/year</b> SAB members (10 members x 2k€)
	<b>TOTAL: 175 k€/year for 1 intake</b>
<b>EXPENSES</b> (after the EU funding period)	<b>TOTAL: 175k€/year for 1 intake</b>
Management: - Coordination	20 k€/y (50% of 40k€/year)
- Travel expenses and local costs of 9 partners	30 k€
Cost of scholars	15k€
Tuition fees for the Universities (see Table 3.5):	45k€ (10 students x 4000€ + 5 x 1000€)
Cost of organisation of events as EMSHIP Week, visits, web site, publicity & communications.....	10k€
Scholarship for students (see items (2) and (3) above: 33+ 22 k€)	55k€

#### **a) EMSHIP<sup>+</sup> (a previously funded EMJMD) requests for additional funding: justifications**

**EMSHIP<sup>+</sup> cannot be considered as the natural continuation of the former EMSHIP programme.** As explained in Section 1.3.c, the targeted students are different. So **EMSHIP<sup>+</sup> has to be considered as a new programme and needs EU support to be mature and sustainable after 4 intakes.**

As shown in Tables 3.7 and 3.8 (during the funding period) by comparison with Table 4.1 (after the funding period), **the EU support is mandatory to take off and full EM scholarships are really necessary to attract the best students.** Indeed, the EU financial support is necessary to cover the expenses required (Section 1.3.c):

- to run the EMSHIP<sup>+</sup> educational and transversal activities until it becomes sustainable: EMSHIP<sup>+</sup> website and the Learning Management tool (with annually updated information, documents and procedures of the online application platform, preparatory procedures including individually tailored documents, accommodation assistance, study plan & tutor assignment, and EMSHIP<sup>+</sup> grants for self-funded);
- to support the MMC and Alumni students' representatives, lecturing fees (invited prof., visits, preparation of specific course material, lab work consumables, software licenses, books, etc.), the annual EMSHIP<sup>+</sup> week with participation of alumni, industrials and technical visits; and
- to allow EMSHIP<sup>+</sup> to be included in the EMJMD catalogue and beneficiate of the Erasmus<sup>+</sup> Mundus brand in order to have the relevant and worldwide visibility and attractiveness.

After 3-4 years (Fig. 4.2) we are convinced that an **effective recruitment will be guaranteed** (relying on the alumni, international contacts and EMSHIP<sup>+</sup> website), having enough self-funded students and industrial scholarships to continue attracting excellent students (and not only the richest) to ensure the excellence of this programme.

Based on our survey, during the first years more than 50% of the candidates heard for the first time about EMSHIP through the EACEA catalogue (website). After, it changed; only 25% of the students had their first contact through the EACEA website, about 50% through Alumni (word of mouth) and the EMSHIP<sup>+</sup> website capturing the remaining 25%. This clearly explains why an additional funding is required during a few years.

#### **b) EMSHIP<sup>+</sup> will mobilise self-funded students and non-EU funding to propose scholarships**

In longer term, **the sustainability will be improved with the networking** done by the Alumni; the **“word of mouth”** being the most effective recruitment means.

The Consortium has set up **a system of tuition fee waivers and scholarships for excellent students** (“EMSHIP<sup>+</sup> Student Support Fund”), particularly with a view of supporting excellent students from non-EEA countries with more limited funding opportunities. The funds (not accessible for EMJMD scholarship holders) are (Table 4.1, items 2 to 4):

- Industrial companies fund scholarships for their employees (Tables 3.10);
- Self-funded students may receive 400 €/month during their internships (HSVA, Bureau Veritas, DNV-GL, etc.);
- University partners will provide scholarships (66k€/year) coming from internal organisation (Table 3.10)
- Whatever their nationality is, students can beneficiate during their 2<sup>nd</sup> year (not accessible to EMJMD scholarship holders) of a standard ERASMUS<sup>+</sup> mobility grant (awarded by ULiège as 1<sup>st</sup> year univ.), about 300-400€/month;
- At ECN (Nantes) - 2<sup>nd</sup> year of education, students can beneficiate from a financial support awarded by the Region “Pays de la Loire” (about 300-400€/month);
- ALUMNI EMSHIP<sup>+</sup> student group has decided to create an annual award (funded by the Alumni) to support financially one student with a scholarship (3-4 k€/year);

*Student loan:* Self-supporting students will be assisted in obtaining grants through a wide range of funding schemes which

are currently active (e.g. the Erasmus<sup>+</sup> Master programme study loans), see [www.erasmusplus.org.uk/master-loan](http://www.erasmusplus.org.uk/master-loan) or [www.findamasters.com/funding/guides/erasmus-loans.aspx](http://www.findamasters.com/funding/guides/erasmus-loans.aspx).

#### 4.2. EMSHIP<sup>+</sup> will generate impact at institutional level, and enhances the internationalisation strategy of the Consortium partners towards relevant stakeholders at national/European/international level.

##### a) The expected impact at institutional level (university/Consortium) of EMSHIP<sup>+</sup> (Table 4.2)

Partners	Table 4.2: Expected impacts at institutional level
<b>All partners</b>	In the EMSHIP <sup>+</sup> Consortium there are universities at various level of development of international cooperation. As the Consortium includes very strong universities in research and development (ECN and UPM), other members of the Consortium (ZUT and UGAL) will be able to take advantage of this expertise, creating new possibilities for the students to join research groups for a short period. At long-term structural network with external guest lecturers/scholars and industry will be realised.
<b>ULiège (Belgium)</b>	ULiège coordinates several EMJMD (EMerald, FAME, SUSCOS, MER), has a good experience in managing consortia and international programmes, organizes many programmes in English and runs about 40 double-degrees mostly in Europe. So expected impact is to <u>sustain their policy of having high visibility, recruit students, internationalisation of the cursus and propose Master taught in English for local students.</u>
<b>ECN (France)</b>	ECN manages 4 EMJMD. Internationalisation is very important for ECN <u>to strengthen its visibility</u> , in terms of <u>education and research</u> . Hydrodynamics is one of the specialties of ECN with high level education, facilities and research teams. For all these reasons the participation to EMSHIP <sup>+</sup> with high level EU and non-European universities are of primary importance for ECN.
<b>URO (Germany)</b>	At URO there are more than 10% of foreign students who can join international programmes. URO also offers double degree Masters in “Electrical Engineering” and “Business Informatics”. The Masters in “Computational Science and Engineering” and “Electrical Engineering”, organised <u>in English</u> , attract a large number of foreign students. <u>URO strategy is to extend such developments.</u>
<b>ZUT (Poland) and UGAL (Romania)</b>	Developing <u>international programmes is a priority at ZUT and UGAL</u> . Close cooperation with ULiège, ECN, URO and soon UPM will be beneficial in many aspects of developing international programmes also in the other fields. The implementation of EMSHIP <sup>+</sup> will <u>increase the competence of the institution’s staff</u> . Moreover it will give the possibility to propose internally new subjects (as Offshore Wind Energy supported by UPM) and to train young lecturers, who will be able to offer their own courses.
<b>UPM (Spain)</b>	UPM has a high experience with international cooperation. The participation in EMSHIP <sup>+</sup> will improve this cooperation in the field of marine technologies. This will allow the ETSIN School <u>to increase the number of incoming students and the number of lectures given in English</u> , which are UPM’s internal objectives.
<b>ICAM (France) and SOLENT (UK)</b>	For ICAM and SOLENT the key impact is to <u>be integrated in a European network of universities</u> . Their strategies focus on the student experience and working with students to prepare them for a future in an increasingly global society. In that respect, the EMSHIP <sup>+</sup> has a high impact at institutional level, as it supports the partner university strategic development, and contributes to both student experience and employability.
<b>UNIGE (Italy)</b>	For UNIGE the expected impact is to <u>be more open to international students and develop internal education in English</u> (also for Italian students). So merging local and international students in a Master taught in English is considered as a key impact, with high benefit for local students and for the institution.

Table 4.2 shows that the impact at institutional level is multidimensional: The reputation of excellence of EMJMD fosters each university’s reputation and increases its attractiveness. EMSHIP<sup>+</sup> contributes to recruit excellent students for this programme, but also to recruit international students in other programmes, considering the international reputation of the whole institution. This outreach does not only contribute the recruitment of international students at each University of the Consortium, but also broaden the local university networks and potential partners, for education and research.

The impact is also on pedagogical and disciplinary levels: EMJMDs in general and EMSHIP<sup>+</sup> specifically is an English taught and transdisciplinary programme with innovative ways of teaching (Section 2.1.b). This approach and the success of EMSHIP in terms of recruitment has motivated other programmes, at ULiège, ZUT and URO, to shift towards English and introduce new training elements (as internships) to attract new students.

EMSHIP<sup>+</sup> will also contribute to Internationalisation@home of the universities involved, as it gives the opportunity to local students to meet international students with many different backgrounds and cultures, either in the same class but on a broader scale, on the campus as well and during social activities. EMJMD also gives the opportunity to professors and staff to interact in a multicultural environment. This definitely fosters integration, cultural exchange and networking among the different groups. In addition, EMSHIP<sup>+</sup> will have an impact on local administrative staffs, and not only in International Relations Offices dealing with international issues: language, cultural differences, flexibility with partner regulations, etc.

##### b) EMSHIP<sup>+</sup> supports the internationalisation strategy of the partners and facilitates outreach towards stakeholders at national/European/international level

The intention of EMSHIP<sup>+</sup> is **to build an international network of educational institutions** (Section 1.5.a), which will support the Consortium operating the educational process and offering attractive internship positions in overseas companies. EMSHIP<sup>+</sup> has 7 world class universities as associated partners (Fig 1.4). It will enable exchange of scholars and spread technical knowledge in various parts of the world. The Consortium also includes WEGEMT, EU Association composed of 40 Marine Universities from 17 countries. It aims updating skills and competence of engineers and postgraduates working in marine technology. WEGEMT participates at EU H2020 initiatives as BLUE CARRERS.

The Programme will also result in increasing international experience of local students. EMSHIP<sup>+</sup> students have to work in team with local students in the context of projects to realize in small groups. This will increase networking and give local students a positive experience of collaboration with international students (e.g. through cultural exchange). On a broader scale, the international students taking part to the programme will also be beneficial to the city where they are located, as they will contribute to open minds of local citizens towards foreigners. The recruitment of international students is part of the social role played by each university. The members of the Consortium will have the opportunity to work with partners they have not worked with before. Students, having their internship in another country, will transfer knowledge between countries, companies and universities. Lecturers will have the opportunity to establish direct contacts. This will lead to further cooperation: joint research, publications, research projects... also establishing personal ties.

### c) Impact on the EHEA (European Higher Education Area).

**The expected impact of EMSHIP<sup>+</sup> on European universities (EHEA) is huge** (see Table 4.3). It will create a long-term structural network including external guest lecturers/scholars, universities, companies, local administration, and, most important, the graduates. The impact on EHEA will be tailored to students' and employers' needs: students will have closer connections with future employers (through direct contacts with the representatives of the EMSHIP<sup>+</sup> industrial SAB partners during seminars given by these members, the EMSHIP<sup>+</sup> week (with job fair) and the 5-month internship/master thesis done with the industrial members).

The impacts concerning scientific aspects will be research papers as several master theses will be presented at conferences and published in research papers (> 20 papers published during the period 2012-2018), thus increasing the scientific credibility of the EHEA, and preparing graduates for doctoral study, further enhancing the potential of the EHEA.

The current situation of employment of both local and international graduates clearly indicates the need for graduates with diversified high level qualifications in naval architecture and marine engineering (see Section 1.3.a and Annex A2: Employability). These needs, and the capability of our graduates to meet them, justify the existence of EMSHIP<sup>+</sup>, which is focused on mobility, enabling students to learn multiculturalism and good practices in at least three locations. This diversity will increase the potential of the EU universities (EHEA) to be more competitive worldwide.

The staff of international dept. will also visit their partners' universities. So, the experience of some partners will be transferred to less experienced partners (ZUT, UGAL, UPM...) and therefore will impact the EHEA.

**Table 4.3: EMSHIP<sup>+</sup> Impacts on the EHEA**

<b>What</b>	<b>How</b>
Promoting student mobility	Three or four mobilities can be performed in EU but also worldwide
Strengthening the attractiveness of the EU Higher Education Area outside Europe	Recruiting students from all over the world; promoting European knowledge, competence as well as historical, cultural and social issues
Adopting a system of education fitting the needs of the labour market	Participation of the industrial companies in developing and evaluating the educational programme, formulation of the master theses
Increase the attractiveness and improve the competitive position of the EHEA	Developing and realizing excellent programme in close cooperation with industry
Promoting the necessary European dimension in higher education	Curriculum development, inter-university cooperation, exchange programs, integrated study programs and training and research
Implementation of standards and recommendations in the scope of ensuring High Quality of Education	Centralized website; joint online application, selection and admission; progress reports; complaint management; common admission criteria; mandatory mobilities; annual EMSHIP <sup>+</sup> week; use of EU grades (ECTS); joint evaluation (exam, master thesis); compulsory internship; joint QA procedures; recruiting scholars from associated partners; theses assessed by 2 academic and industrial partners; and SAB serving as an independent expert team.
Implementing flexible learning paths and creating the possibility of recognizing the effects of education in other forms than those traditionally offered traditionally.	Students can select their educational path according to their preferences and interests choosing university to study during M2 as well as an internship company; students can also select lectures they want to attend (elective subjects), students can study in up to three EU countries or even beyond EU

### d) Expected impact of EMSHIP<sup>+</sup> outside academia

First, there are companies and research institutes offering internships, which will be highly impacted due to intercultural exchange, opening mind to the world and the ability to improve the language skills of their employees. Students engaged in the cultural activities will promote their own countries and culture. Their presence will promote tolerance and respect for foreigners. Knowledge will flow towards enterprises (information about current problems in the shipbuilding industry). It will lead to raise competence and increase integration between partners.

Secondly, EMSHIP<sup>+</sup> will contribute to provide higher quality workforce to EU industrial partners (EU students but also non-EU Students). Students will enrich the internship companies with their work. They will do specific work for them, but they will also culturally enrich the business environment. Indeed, a large number (> 50%) of EMSHIP<sup>+</sup> graduates (EMSHIP alumni) will find attractive positions in a wide range of employment areas (shipyards, classification societies, maritime-related companies, equipment producers...).

#### e) Tools to be used to measure results and assess their impact

Parameters to measure EMSHIP<sup>+</sup> results and impacts will be (see Annex 1, pages 1-2, as an examples):

- % of graduates employed after 6 months;	- Average number of months to find a job after graduation (target 3 months);
- % of graduates working in EU;	- Nbr of EU and non EU students
- % of drop-outs and success in M1;	- Nbr of papers published by/or with EMSHIP <sup>+</sup> students/alumni (> 3/year)
- % of PhD students among graduates;	- Nbr of access to EMSHIP <sup>+</sup> web site (> 500/month).

The employment prospects will be based on official data from ULiège-ECN-URO-ZUT's social networks and Alumni database. From the start of EMSHIP<sup>+</sup>, the data are collected, measuring systematically the results and impacts to compare EMSHIP<sup>+</sup> and Masters in Naval Architecture run in other EU Universities). The EMSHIP<sup>+</sup> website will communicate employment data to all prospective students and employers transparently.

There is also the SA student survey (done on the LMS EMSHIP<sup>+</sup> intranet) - see details in Section 2.2.b.

### 4.3. **EMSHIP<sup>+</sup> encourages entrepreneurship and a sense of initiative. Employers are involved in course implementation in order to improve students competencies and skills and enhance employability**

#### a) Entrepreneurship will be encouraged in order to maximise professional opportunities

Several EMSHIP<sup>+</sup> lectures target the acquisition of entrepreneurial skills (personal skills and business skills). Students have to learn how to work in teams and communicate their results.

A first course (given by UPM at ULiège) will be organized to initiate students into the possibility to launch their own business soon after their graduation. The students will get the opportunity to take solid basic knowledge courses in finance, marketing, business model, operations management, etc. based on the design of an Offshore wind park (as case study).

EMSHIP<sup>+</sup> will also integrate the research and initiative dimensions within workshops, internship and master thesis. For their last semester, the students will perform their thesis with an industrial partner and have therefore the opportunity to work on real-life projects. The long internship (5 months) in companies will give them a close vision of the real industrial problems. This will help them to think about different solutions and open their mind to new business areas.

Students interested in starting a career as entrepreneur can contact incubators close to the partner universities e.g. WSL Incubator ([www.wsl.be](http://www.wsl.be)) in Liège and the program for entrepreneurship ([www.upm.es/actuaupm](http://www.upm.es/actuaupm)) in Madrid.

#### ➔ **EMSHIP<sup>+</sup> helps to become enterprising individuals:**

The cursus at UPM (Spain), new partner in Marine Renewable Energy, dedicates a strong part to entrepreneurship. So the students will have 2 chances to become enterprising individual.

First during the 1<sup>st</sup> year (at ULiège), UPM (Madrid) and ULiège will give specific seminars about “entrepreneurship”:

- Entrepreneurship: Projects Operation and Management; Financial principles; Contract assessment.
- Mission Personal project- [www.programmes.uliege.be/cocoon/20182019/en/programmes/G3ENTR01\\_C.html](http://www.programmes.uliege.be/cocoon/20182019/en/programmes/G3ENTR01_C.html)

Later, students selecting UPM as location for master thesis and internship (4<sup>th</sup> semester) will be able to attend training and specific lectures with industrial targets, as UPM Innovatech Workshop (see more information on <https://upminnovatech.blogspot.com/p/workshop-upm.html>).

In addition, the EMSHIP<sup>+</sup> Programme includes “*Principles of management*” given at ULiège and “*Cost-benefit analysis and optimisation of business projects in marine industry*” given at ZUT – both of them are also dedicated to develop enterprising individual ability.

#### **Outcomes of these classes/trainings will be:**

- Understanding the principles of work organization: organizational structures, division of competences, procedures, work planning, control;
- Shaping professional skills related directly to the place where the internship takes place.
- Verification, development and practical application of skills acquired during the studies.
- Improving the ability to organize a team work, effective time management and shaping responsibility for tasks.
- Gaining experience and practical knowledge to help starting a career after graduation.
- Preparing the student to go outside the universities' walls and start independent professional activity.

#### ➔ **Relevant activities to use professional opportunities in a proactive way are:**

M1 at ULiège:

- Project of designing a ship from A to Z, in team, will give the opportunity to each student to lead the group;
- Seminar on how to apply for a job in Europe;
- 1<sup>st</sup> EMSHIP<sup>+</sup> week with informal meetings with industrials and short summer traineeships (between M1 and M2);

M2 at ECN-URO-ZUT (1<sup>st</sup> semester):

- M2: 2<sup>nd</sup> EMSHIP<sup>+</sup> week: meetings with industrials to discuss internships and master thesis and possible jobs.

**M2 at UPM, ICAM, SOLENT, UGAL, UNIGE:**

- Internship in industrial company (5 months) is a fundamental integrated part of the programme. It gives job opportunities but also helps to understand the marine world and ship building industry.
- Presentation by students of their master thesis in front of academics and industrials (to develop communication skills).

In addition we should mention that:

- EMSHIP<sup>+</sup> focuses on fostering active learning and skills-oriented learning (using activities such as presentations, case study, team projects...), which promote the sense of initiative and collaborative work;
- Participation in research works in partner laboratories, during which students will have the opportunity to work directly with staff or other experts raising the interest towards the job of researcher.
- Students will also be encouraged to learn not only about the technical aspects of company's projects but also on problems related to finance, administration and management during their internships.
- Learning other languages is capital to do business: local language classes will be offered to students all along the programme according to where they study (e.g. French classes at ECN integrated in the Program, 4 ECTS).
- Students will study in 3 different locations (in 2 or 3 countries) so that they will gain confidence and enhance communication skills with other nations and cultures.

Developing students' leadership abilities will also be promoted by:

- Being class delegate, becoming a student representative at the EMSHIP<sup>+</sup> MMC or the EMSHIP<sup>+</sup> Alumni team;
- Joint performance of projects done by groups of students,
- Organising events such as EMSHIP<sup>+</sup> lunch, transportation between different locations.....

**b) The needs of future employers in the EMSHIP<sup>+</sup> field is taken into account to maximise employability.**

EMSHIP<sup>+</sup> takes into account the needs of employers (including soft-skills) to increase employability by:

- Active participation of the employers in the programme with the organisation of a job fair, and
- Strong links with industrial partners from the marine world with short seminars, participation in the EMSHIP<sup>+</sup> week, members of the strategic board, revising lecture content and welcoming students for internship.

To increase employability of our graduates, potential employers are incorporated into the programme to improve student competencies and skills through a range of measures:

- Some employers are members of the EMSHIP<sup>+</sup> Industrial Board, which is involved in the programme (see Annex A4).
- Each year at EMSHIP week (& job fair), potential employers are invited to meet the Consortium to discuss and, possibly, modify the contents of the lectures to comply with the current requirements and expectations of the maritime industry, as well as specific evaluation of the programme from employability and impact perspectives.
- In collaboration with academic staff, future employers will propose topics for internships and master theses, falling into the actual business and research activities and projects, and may co-supervise the master theses (with an academic being the official supervisor). It is also planned to invite employers to the dissertation defence as well as to programmed events (EMSHIP<sup>+</sup> week) to facilitate communication between students and the labour market.

Thanks to these, future employers can provide topics interesting both for them and the students, and they will become familiar with the excellent quality of the programme and the students. Via participation in the annual EMSHIP<sup>+</sup> week, they will have an opportunity to recruit the best graduates.

- They will also be invited as guest lecturers to present case-studies from their own experience (see Section 2.3.c).
- Whenever possible, collaboration in research projects with these companies will be promoted.

**c) The public and private sector stakeholders will develop the horizontal skills of the EMSHIP<sup>+</sup> students.**

EMSHIP<sup>+</sup> targets the **intercultural awareness** including diversity of human behaviour. EMSHIP<sup>+</sup> plans to run events with the public sector in which students introduce aspects of their countries/cultures. These events will be enriched by student-organised events (as Science café).

The horizontal skills promoted by the public and private sectors through the EMSHIP<sup>+</sup> program are:

- **Foreign language** competencies: English is the programme language. Free access to other languages (French, German, Spanish, Polish, etc.) is given and practice can be exercised by meeting local students and during internship.
- **Entrepreneurship**: UPM will give at ULiège a module on entrepreneurship with support of industry (private sector).
- **Communication ability**:
  - o Open Science: students will disseminate results of their scientific research in formats accessible to all levels of the society, from a communication to specialists (as conference) to multimedia dissemination to wide public.
  - o EMSHIP<sup>+</sup> week (and job fair) is a unique opportunity to meet industrial SAB members (**Private sector**), which are key industrial players from the public and/or private sector.

**4.4. Types and methods of promotion/dissemination mechanisms, target groups, and concrete tasks of the partners in the awareness-raising strategy of EMSHIP<sup>+</sup>. Plans to attract excellent students worldwide.****a) EMSHIP<sup>+</sup> will world-wide attract excellent students, scholars and guest lecturers**

**Communication plan** (before- during- after the financing period) **towards the target groups (end-users (industries), decision makers (politics), scholars, press/media and candidates)** is the following:

**Before:** we can partly benefit from the visibility given by the former project (2010-2017). The new EMSHIP<sup>+</sup> Master is running since Sept 2017, with an active website. The online registration is open to select excellent students for Sept 2019.

The first instrument for EMSHIP<sup>+</sup> promotion is the website ([www.emship.eu](http://www.emship.eu)), which is already operational, and designed to cutting-edge standards (web site readable on Smart Phone), including the course content, university presentations, career opportunities, bibliographic notes of the graduates, FAQ, alumni contacts, and the online registration. From the feedbacks of past experience (former EMSHIP), many students (50%) have been first informed about EMSHIP through Alumni or local contacts. For that reason, we will give priority to Alumni network and associated partners to promote EMSHIP<sup>+</sup>, but the visibility through the EM label and web site is also essential.

EMSHIP<sup>+</sup> will be advertised by the national agencies in each country of partners' universities (WB Campus in Belgium, Campus France in France, DAAD in Germany...). For instance, Wallonia-Brussels Campus (WBCampus) is the agency for promoting higher education of Wallonia-Brussels abroad. It is committed to support higher education institutions and foreign students alike. It promotes the higher education of French-speaking Belgium on the international stage through:

- the website [www.studyinbelgium.be](http://www.studyinbelgium.be) allows foreign students to access all the information they need to prepare for a period of study in Wallonia-Brussels, from the choice of course to the practical aspects of their stay. This portal gathers, all Erasmus Mundus programmes offered by HEI in French speaking Belgium;
- participation in promotional events abroad in order to promote higher education.

**During and After:** the promotion towards potential students, scholars, industrialists, etc. is done through various mechanisms:

- Active use of the **Alumni** and their success stories as ambassadors of our Programme, by direct communication and internet networking (such as Facebook and LinkedIn). In 2018, we organised a contest among Alumni for the best testimony video, published on YouTube ([www.youtube.com/channel/UCgaPIXtgp\\_vwkg87PnrndRg](http://www.youtube.com/channel/UCgaPIXtgp_vwkg87PnrndRg));
- **Industrial SAB members** promote the EMSHIP<sup>+</sup> programme in their companies and professional networks.
- Cooperation with the **associated partners** (in USA, Japan, Korea, Brazil, Australia.....) will result in the promotion of EMSHIP<sup>+</sup> throughout their universities and local student associations.
- **Flyers and posters** are distributed at conferences, information sessions, Higher Education fairs, and other international meetings, by staff, as well as on multimedia by Alumni – Targets: candidates, decision makers and press/media;
- **Academic network** (associated partners from all over the world) and **professional societies** (RINA, SNAME, etc.)
- **WEGEMT** (EU associated partners) **disseminates** EMSHIP<sup>+</sup> results as its aim is to extend the skills, knowledge and competence of practising engineers and postgraduate students working at an advanced level in marine technology.
- Participation in several **higher education fairs** (NAFSA, APAIE, etc.) – Target : candidates;
- Presence **on educational portals**, such as FindAMasters.com, UniversitiesAbroad.com, StudyPortals.eu, Studylink, University Interchange, Campus France, DAAD, Keystone and MasterPortal – Target : candidates;
- Informing and promoting the Programme during **personal visits/contacts** at research academia and business partners.
- **Publication of joint papers** will confirm high quality education of the programme. For instance Rigo P, Bronsart R, Taczala M (2015), “EMSHIP<sup>+</sup>, A UNIQUE EUROPEAN MASTER PROGRAMME IN SHIPS & OFFSHORE STRUCTURES”, published by The Royal Institution of Naval Architects, December 2015, London, UK.

**After:** for dissemination purpose, key results will be uploaded on the Erasmus<sup>+</sup> Projects Results Platform (see here after in Section 4.4.d) as well as on the EMSHIP<sup>+</sup> website and the local web sites of the 9 partner universities.

**Scholars** will be typically approached by direct contacts to department chairs (members of our networks) asking them specialized lecturers/professors in specific topics as Ship Engines, Composite material, Maritime Economy (Business) and Maritime Safety (IMO), etc. In addition, an open call for all positions will be available. The **EMSHIP<sup>+</sup> web site** contains a **permanent call for scholars**, who may apply online by uploading their motivation letter, technical interest and CV.

### **b) Role of the Consortium partners in the action plan to promote the programme.**

The concrete tasks of the partners (including communication and promotion) are listed Table 3.3 and Fig 1.3. **ULiège** is in charge of EMSHIP<sup>+</sup> website and social networks; **ECN** of promotion and marketing (poster, flyers, ..), **ZUT** of social Media; **ICAM** of the contacts with Industry; **URO** of Communication infrastructure (LMS); **SOLENT** of communication strategy; **UNIGE** of job placement... Academic staffs of Consortium universities have international networks through their presence in scientific committees (ISSC, ITTC, ISO, IMO...) and editorial boards (Marine Structures, JMST, OMAE...), their attendance at conferences, and a large number of bilateral collaborations, including international ones.

The **Consortium management will have the support and advice of one alumni** (part time job), to have a strategic oversight of the marketing, promotion and advertising of the programme, monitor costs and effectiveness of various channels and ensure that promotional material is consistent and remains up-to-date across all Consortium Partners.

The **industrial SAB companies** have expressed their enthusiasm for the Programme, and they will be happy to support and promote it (more than 30 companies have already sent a letter of intent).

Support of the **overseas partners** via distributing information on the programme will also reinforce the promotion action plan (see Annex C: letters of intent of the 8 associated partners and their presentations).

### **c) Key players targeted by the promotion/dissemination strategy (outside the student community)**

Key players targeted (for recruitment and dissemination purpose) by the EMSHIP<sup>+</sup> programme are the **industrial partners from EU but also worldwide**. The industrial board (SAB) of EMSHIP<sup>+</sup> is composed of more than 30 members of EU Industry and few non-EU industrial partners, such as COTECMAR (Columbia) and OMCS Class (Panama) appointed by the

Panama Maritime Administration. SAB members participating in EMSHIP<sup>+</sup> week can be mobilized for recruitment, job placement and dissemination actions. Through these industrial SAB members, both **promotion** and **dissemination** strategies will be achieved.

In addition, **associated partners from USA, Japan, South Korea, Australia, Brazil, Turkey and Algeria** (Fig 1.4) as well as **WEGEMT**, will support the Consortium in promoting the programme, targeting the **universities of their region/country** (as well as industrial partners to propose internships).

Information will also be distributed by **the student organizations, Universities' associations as well as employers' associations**. For that purpose, we encourage students to participate in international contests (see Section 1.1.b) and our internal contest for best testimony video published on YouTube. In addition, Alumni regularly post news with reference to EMSHIP on LinkedIn (individual initiative).

**d) Measures to disseminate and exploit project results, optimise their value, strengthen their impact, transfer them to different contexts, integrate them in a sustainable way and use them actively at European and worldwide levels**

Throughout the lifetime of EMSHIP<sup>+</sup>, we will encourage staff and students to :

- Disseminate results in scientific journals and conferences, but also to non-academic partners at business meetings (for industry or commercial partners) and specific EU associations (as Waterborne EU Platform, WEGEMT, EERA.....).
- Students and graduates will publish papers presenting the results of their investigation for the master theses and will have an opportunity to participate in the conferences such as the Nordic University Workshop DNV-GL and student fairs. Some results are expected to be disseminated through H2020 projects such as BESST, JOULES, and HOLISHIP.
- Encourage EMSHIP<sup>+</sup> staff and students to be active on social media (Facebook, blogs, Twitter) to demonstrate the range of issues they can address from their professional background.
- The best graduates will be awarded for their achievements by SAB members during the annual EMSHIP<sup>+</sup> week.
- Dissemination performed through H2020 projects: towards students (for instance through seminars given by members of H2020 projects as dissemination activities), but also from EMSHIP<sup>+</sup> Consortium towards the H2020 Consortium (for instance, through projects led by WEGEMT as BLUE CARRERS in which the EMSHIP<sup>+</sup> experience and education program will be used as support for these EU projects).
- At the end of the EMSHIP<sup>+</sup> project, the partners will fill the “Erasmus<sup>+</sup> Project Results Platform” in with up-to-date information about results and achievements of the graduates and the Consortium's universities' projects (<https://ec.europa.eu/programmes/erasmus-plus/projects>).

**4.5. If relevant, the proposal describes how the materials, documents and media produced will be made freely available and promoted through open licences, and does not contain disproportionate limitations.**

All materials necessary for studying and developed by the lecturers will be available on EMSHIP<sup>+</sup> Intranet (LMS) to all the students, together with master thesis, documents, papers, and designs. Moreover, the master thesis presentations (PPT) are publicly available on the EMSHIP<sup>+</sup> website ([www.emship.eu](http://www.emship.eu)). The EMSHIP<sup>+</sup> master theses are available to public on the MatheO website: <https://matheo.uliege.be/simple-search?query=constructions+navales>.

This is further promoted through **open educational resources (OER)** which means teaching, learning, and research materials in any medium will reside in the public domain or will be released under an open license. Indeed, EMSHIP<sup>+</sup> aims to minimize the copyright barriers, supporting the open education mission through advocacy and outreach on using the right licenses and open policies, to maximize the benefits of open educational resources and the return on investment in publicly funded education resources. Indeed, the Consortium shares the principle of the Open Access to allow the widest possible dissemination of scientific information, so as to facilitate the dissemination and development of knowledge.

The University of Liège is part of the pioneers of the movement by becoming, in 2007, the 10<sup>th</sup> institution in the world to sign the mandate making the deposit of scientific references in its institutional directory obligatory. Called **ORBi** (Open and Repository Bibliography), the digital repertoire has become essential. The academics of EMSHIP<sup>+</sup> are convinced of the interest of depositing their texts in Open Access, which improves their visibility, their referencing and their quotation rate.

Educational resources developed when realizing the Programme (plans, textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation) will be freely available for use, reuse, adaptation, and sharing. However, it should be noted that in some specific cases, we may encounter restrictions imposed by the internship companies which should be observed, as the students may have access to the confidential material, designs and data (but executive summary will remain public).

As the master theses will be developed with important content of results of research, they can also be presented at conferences and published in scientific journals. Regarding the access to the materials developed by the students, a possibility of publishing and making the materials available to the Consortium universities can also be realized, by observing the national and internal regulations. For these reasons, in principle, the copyright will be ceded by the EMSHIP<sup>+</sup> students to the EMSHIP<sup>+</sup> universities (in relation to master thesis).

Finally, apart from the formal reporting, EMSHIP<sup>+</sup> student's outcomes (master thesis, projects...) may be disseminated through recognized publications and conferences. The use of digital media to produce and disseminate educational material and results will be actively supported. During the vivas, the best thesis defence presentations will be awarded by Industrial partners and recorded for later use and dissemination.