Erasmus Mundus Call for Proposals 2010 (EACEA/29/09)
A - Award criteria for Erasmus Mundus Masters Courses (EMMC)

A.1 *Academic quality - Course content (30 % of the max. score)*

A.1.1 Describe the EMMC's **objectives** (including in socio-economic terms) in relation to the **needs analysis** in the field(s) concerned.

Despite a favourable growth rate in the field of membrane technology, with more than hundred of current available positions, none master fully devoted to this area exists in Europe or all over the world. Based on this observation, our consortium of European Universities (see Appendix 1) decided to design the project of **Erasmus Mundus Master in Membrane Engineering (EM3E)**.The objectives of the EM3E project are to expand knowledge and educate students in Membrane Science in order to provide outstanding students to be inserted in the industry or in academic research. For instance, the recruitment at a master level in a membrane industry is constricted to either a "material" or a "chemical engineering" profile with no specific background and advanced knowledge in the field of Membrane Science, which represents a terrible waste of time of formation and so money for industrial companies and also does not enable a fast adaptation and implication in the frame of doctoral studies.

As a matter of fact, environmental concerns like massive scale air or water pollution and also the gradual rarefaction of fossil energy resources gave rise to the concept of sustainable growth and to related strategies like process intensification, water and solvents at their point of use, hydrogen as energetic vector (requiring H_2 production and using fuel cells as electric generators) or CO_2 capture and storage. Membrane processes have a key role in the construction of these strategies. Moreover a lot of separation operations are currently performed using membranes in industrial processes. Among the major applications for liquids, it can be mentioned the water desalination by reverse osmosis, the preparation of food, beverage, dairy or pharmaceutical products or the treatment and the recycling of industrial effluents, the production of tap or ultrapure water, the dehydration of ethanol, the dialysis of blood (artificial kidney), etc. For gas separation, some examples of current applications are the removal of hydrogen from ammonia synthesis gas, the removal of carbon dioxide from natural gas and the air separation. On the other hand, the industrial market of membrane bioreactors (MBR) for wastewater treatments is now considered as mature, and the European Directive on Integrated Pollution Prevention and Control EC96/61 encourages the use of MBR as "**Best Available Technology**" by many industries. National and European regulations (as for instance, Integrated Pollution Prevention Control Directive 96/61/EEC, Urban Waste Water Treatment Directive 91/271/EEC), and the economical pressure also favour internal water recycling[1].

The North European market on membrane separation systems is currently passing through a **high growth phase**, catalysed by steadily increasing demand from both the municipal and the industrial sectors, reaching $1 billion[2]. Reverse Osmosis market is estimated at close to $10 Billion dollars in size, growing at double digit rates (in Europe ~ 10% per year) and it includes a good number of companies originated in the major geographical market -the US, Japan, Europe, and Asia/China, with most of them playing the global sales game[3].

Intensive efforts of R&D are now engaged over the world to develop high performance membranes. As an example, the membrane technologies are identified as "**Key Technologies 2010**" by the French government. The European Federation of Chemical engineering (more than 100,000 members) has now a new section dedicated to "Membrane Engineering". A European Network of Excellence named NanoMemPro (acronym for "Expanding membrane macro scale applications by exploring nanoscale material properties"), was funded for 4.5 years (2004-2009) in the scope of the FP6 http://www.nanomempro.euromemhouse.com/) and has created a legal entity, the European Membrane House (http://www.euromemhouse.com) which now host all the activities.

One of the main objectives of NanoMemPro was the establishment of long-term synergies between European teachers, researchers, engineers, manufacturers, suppliers and end-users in order to solve problems related to the multidisciplinary nature of membrane science and engineering. The creation of education programs in Membrane Engineering was strongly supported by the Club of Interest of NanoMemPro gathering a significant number of small and medium-sized enterprises or large industrial companies covering fields of activities related to membrane engineering. It was also the case of the European Membrane Society (EMS) and of a lot of academic institutions all over the world. Corresponding

[1] B. Lesjean and E. H. Huisjes, IWA 4th International Membrane Technologies Conference, May 15-17th 2007, Harrogate, UK.

[2] Membrane Technology 4 (2007) 3.

[3] J. Fernandez, Water Purification by Membrane Filtration is a fast growing global market, Gerson Lehrman Group (2007).

support letters are attached to this application (see Appendix 2).

The EM3E project is believed to answer most of the industrial and academic needs in terms of background and advanced knowledge in Membrane Science, by bringing together the expertise of the best European Universities working in that field in the frame of a close relationship with the industrial and academic worlds.

A.1.2 Explain the EMMC's **added value** compared with existing masters courses in the same field at national, European and international level.

As previously mentioned, a systematic investigation has been performed about the possible existence of multidisciplinary Master degrees entirely devoted to membranes over the world. The North America Membrane Society and the main Asian and Australian Societies on Membranes have been questioned. Numerous master degrees, usually centred on Materials Science or on Chemical Engineering, have been identified with no more than three courses related to membrane. In consequence, this Erasmus Mundus Master would be the first over the world to respond to industrial and academic concerns in Membrane Science and Technology.

The creation of this education program in Membrane Engineering was strongly supported by the Club of Interest of NanoMemPro grouping a significant number of small and medium-sized enterprises or large industrial companies covering fields of activities related to membrane engineering. It was also the case of the European Membrane Society (EMS) and of a lot of academic establishments all over the world. Corresponding support letters are attached to this application (see Appendix 2).

This new curriculum will offer coherent courses integrating the best of the partners' skills. The training program has been prepared during meetings attended by the different partners of NanoMemPro Network of Excellence and by integrating the advises and requests of professional sectors. It will enable to promote excellence, innovation, mobility and diversity in high-quality courses related to membrane science and engineering at the interface between material science and chemical engineering. Students will benefit of the teaching of **internationally recognised specialists** being deeply involved in this field both at scientific and at industrial levels. The strong implication of all these teachers in the field of membrane research and/or technologies would enable to perform high-level courses with already updated contents.

In the frame of the recognised Erasmus Mundus program with an international visibility, the Master course will bring to Europe highly-motivated and educated students in the increasingly important and competitive domain of membrane science and engineering.

A.1.3 Present the **structure and content** of the EMMC and justify the added value and relevance of the **mandatory mobility** component.

The EM3E Master programme is schematically depicted in Figure 1. The programme spreads over 2 years (120 ECTS) of normal study. The courses provided in the four semesters, S1-S4, bridge different scientific domains like material science, physics & chemistry, engineering & processes, while keeping a focus on relevant applications of membranes in food and health industry, industrial and chemical processing, energy, environmental control, pharmaceutical industry, biomedical applications, etc. The planned number of students per academic year is ~ 30.

During semester S1, after **registration and an integration week** at the University of Montpellier 2 (UM2), France, all the students will stay together at the University of Montpellier 2 (France) or at the University of Toulouse 3 (UPS), France (the location will be swapped every other academic year between the two universities). The first semester will be on **fundamentals of Materials Science and Chemical Engineering**. Depending on their bachelor track and on the option chosen when applying, students, will have the opportunity to choose between two specialities (four courses) more focused on Materials Science or on Chemical Engineering.

Semester S2 will be on fundamentals of **process modelling and technologies** at the Institute of Chemical Technology of Prague (ICTP), Czech Republic.

The courses offered in the first year, semesters S1 and S2, will provide a broad and flexible orientation in the field of science and technology of membranes.

During the second year, semester S3, students will get advanced courses in one of the following mobility option:
- Biotechnologies, Food and Health, at the University of Lisboa (UNL), Portugal (~ 10 students)
- Nanoscience and Nanotechnology, at the University of Zaragoza (UNIZAR), Spain (~ 10 students)
- Energy and Environment, at the University of Twente (UTwente), The Netherlands (~ 10 students).

In the final semester S4, they will have their first experience in research over a period of 6 months on an extensive research project, in either an academic or an industrial environment. The student will be in charge of planning, critical analysis of the project progress, as well as of reporting.

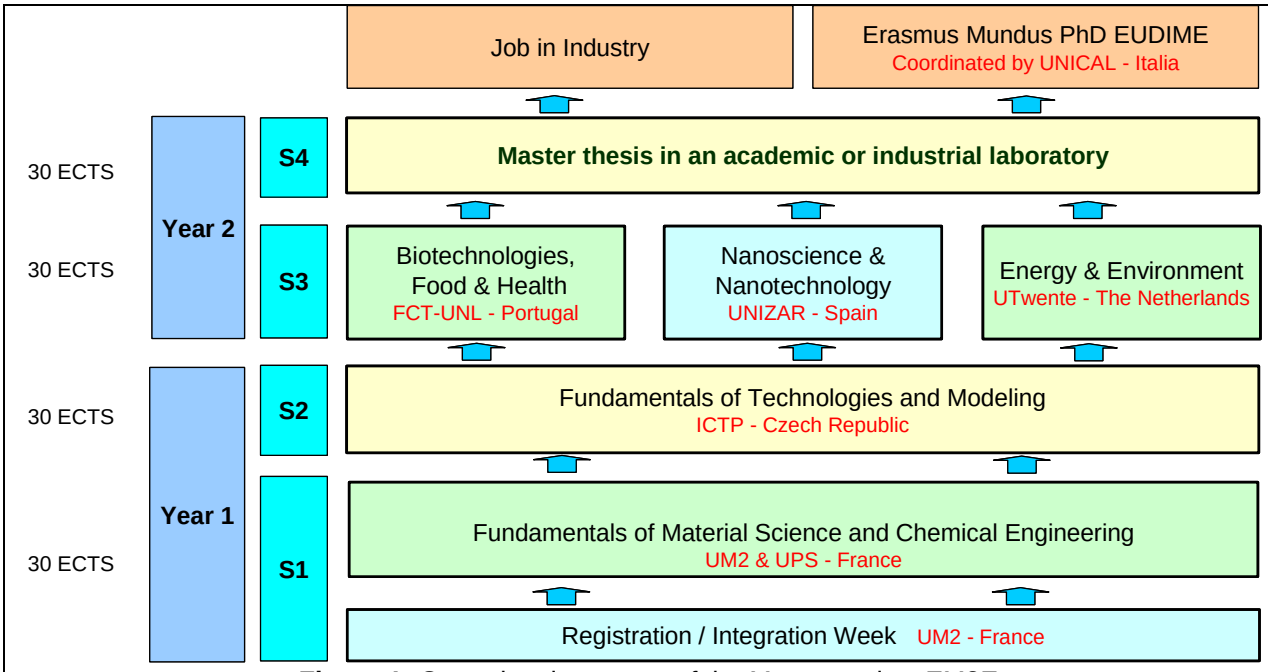

Figure 1: Operational structure of the Master project EM3E.

Semesters S1-S3 will be completed by **individual projects** (6 ECTS), in which the student has to conduct a literature survey and/or experimental study, selected in close consultation with the examination committee.

Detailed descriptions of the content of the scientific courses in semesters S1-S4 are given in Appendix 3. The scientific program will be completed by **compulsory courses** (in semesters S1 and S2) on:
- Safety, Security, Health and Environmental Regulation (2 ECTS);
- Quality Assurance and Laboratory Practice (2 ECTS);
- International and European Labour Law (2 ECTS);
- Intellectual capital management (3 ECTS);
- Valorisation, Marketing and entrepreneurship (3 ECTS).

The used language will be mainly English. However, at each institution, a national language and culture course will be offered to the students. Language acquisition is one of the objectives. The courses further aim at giving an overview of today's culture and society of the country of the home-institution. During the total period (S1-S2-S3), each student will be obliged to be registered at least one time at one of these courses and will have also to make an oral presentation of his individual project in the corresponding national language.

A.1.4 Justify the **learning outcomes** relevance in view of the students' **future academic opportunities** (e.g. at doctorate level) and **employability**.

The choices made for the content and structure of the program are based on a detailed analysis of the European Membrane Strategic and Business Research Agenda (SBRA) established by NanoMemPro in strong links with European industry.

Moreover, the analysis of the requested skills or profiles associated with current job offers in scientific or technological fields evidences the frequent use of key-words such as REACH regulation, Ecodesign, processes intensification, atom economy, sustainability, etc. That is resulting from more and more restrictive regulations and of related new industrial practices. Membranes will play a key role in these new technologies and in the separation operations associated with these strategies. Moreover a lot of separation operations are already performed using membranes in industrial processes (food industry and water production, for example).

As a consequence, the suggested Master program centred on membrane engineering should give highly valuable competences and professional outcomes for the graduate students both for future academic and/or professional careers:
- in Materials Science and Chemical Engineering, (S1);
- in Technologies and Modelling (S2);
- in Biotechnology, Food, Pharmaceutical and Biomedical Technologies for a student who has performed the semester S3 in UNL, in Nanoscience and Nanotechnology for a student who has performed the semester S3 in UNIZAR, or in Energy and Environmental Control for a student who has performed the semester S3 in Utwente.

The Master programme will provide knowledge in membrane engineering, and a first experience in

research through the internship in an academic laboratory or in a company.

They will acquire skills as:
- to be able to communicate at a professional level;
- to have an analytical mind, to be prepared to the labour market;
- to be good at drawing ideas together;
- to be able to manage a team or a project;
- to get a good ability to adapt multicultural and international environment;
- to learn at least 3 European languages;
- to use new information and communication technologies and modern research methods and techniques;
- to build a scientific project and write a research proposal;
- to be able to take all position of engineer or researcher in industry or in an academic laboratory.

All of the learning outcomes of the programme are extremely relevant for students' careers, both if they will continue in PhD programmes and if they decide to integrate a job in industries. Through the mobility periods, the internship in associated organisations and the interactions with the other students and staff, the students will experience and learn from different European cultures, improve their language skills, and competencies. All these outcomes will be an advantage for the students' employability or academic opportunities. Already, some of associated partners will open positions to students graduated within the Master programme (see Appendix 2).

A.1.5 Justify the relevance of **the consortium composition** and the expertise of the key **academic staff** involved to achieve the EMMC objectives.

Although membrane engineering is a fundamental and well established discipline, there are only few master programmes with focus on this area. Nowadays, no university in the world can offer the complete range of sub-disciplines of this highly multidisciplinary research area. To our knowledge, Europe offers no internationally organised master programme focussed on membrane engineering. The closest existing international master programmes are in the area of material sciences or nanotechnology and chemical sciences (e.g: MESC, NANOMAT, FAME, EMM-Nano programmes). The goal in Membrane engineering is to integrate disciplines that have traditionally been separated.

Academic quality of the partners and complementarities:

The creation of a Master Mundus in Membrane Engineering (EM3E) is born from the collaboration between European researchers and teachers through the European Network of Excellence on nanoscale-based membrane technologies (NanoMemPro). This network is formed by well-recognised European partners, all leaders in the field of membrane research and technologies. The partners and associated partners of the Master program come from the NanoMemPro Network. They actively participated in the past years to the creation of a Label in "Membrane Engineering at Master level" which was used to promote the mobility of students through Europe.

The universities involved are all **long-existing universities** with research and training activities in many fields of science. The Master Mundus in Membrane Engineering programme will build on the well-developed master courses at each of the six European partner universities. The partner universities complement each other in terms of research and teaching topics, but also in terms of facilities, such as research methods and laboratory equipment. The partners are highly complementary to each other in their expertise and approach, making a joint programme a real asset: Montpellier (UM2), has strengths in Material Science, Toulouse (UPS) excels in Chemical engineering. Prague (ICTP) has a focus on Technologies and Modelling, Lisbon (UNL) is a specialist in Biotechnologies, food and health, Zaragoza (UNIZAR) in Nanosciences and Nanotechnology, and Twente in Energy and Environment. Short descriptions of these six universities with striking facts are provided in Appendix 4.

From each of the partner universities and associated partners, top level researchers and teachers are committed to the EM3E programme. Table 1 lists the key staff involved for the implementation of the programme.

Administrative Key staff:

All the 6 partner universities have the capacity to manage the mobility flows of an Erasmus Mundus Master programme as the EM3E project. They have qualified staff with extensive experience in managing students and staff mobility, within Erasmus, Leonardo actions, Marie Curie & other bilateral or multilateral programs. They have appropriate structures and resources to assist international students, including in most cases on campus housing facilities and cultural and linguistic integration programs. They have a **long standing co-operation and on-going projects in research and training** as they have been collaborating in particular through the Network of Excellence NanoMemPro since 2004.

In each university, in co-ordination with Montpellier 2 University, the EM3E Management Office will facilitate the implementation of the Master. The administrative key staff (Table 1) will be all involved in the implementation of the programme, working in close relation with the teaching/research staff, the secretary and the local co-ordinator. They are administrative responsible or Project Manager of the International

relations Office in the partner universities, and have skills and expertise in organisation and implementation of international programmes with mobility scheme. The EM3E administrative staff will give to the consortium the guarantee of an effective support to the management of the mobility flow for incoming mobility, including practical issues (administrative support for insurance, travel, visas, accommodation etc...). In addition, they will be the link between the administrative organisation of the university and the Master programme (students, teachers, committees). In Montpellier 2 University, a project manager dedicated to the project and specialised in European project will be employed to assist the project co-ordinator, in supplement of the existing administrative and financial services. All the University accounting services and the general administration will supervise the project finances.

Table 1: Key Staff involved in the EM3E programme.
(see Appendix 5 for a more detailed version of Table 1 and for the related Europass CVs).

Partner	*First Name*	*Function*	*Responsibility in the project*
UM2 Fundamentals of Material Sciences	AYRAL André	Professor	Coordinator of the EMMC - Member of Executive Board - Member in admission and examination commitee -Teacher/Mentor - Responsible for the contacts with the associated partner. Member of the Evaluation Committee in charge of organisational arrangements and cooperation mechanism within the consortium.
	ROUALDES Stéphanie	Associate Professor	Teacher/Mentor. Shared responsibilities for supervision of programme with A.A.
	CANADAS Sandrine	Administrative Engineer	Organisation of the implementation of EME3 Master - Member of EM3E Management Office UM2 - Coordination with Partner Office
UPS Fundamental of Chemical Engineering	Patrice BACCHIN	Professor	Member of the Executive Board - Coordinator of the semester S1 in Toulouse. Member in admission and examination commitee - Teacher/Mentor. Member of the Evaluation Committee in charge of management of the e-learning platform.
	Pierre AIMAR	Senior Researcher – CNRS	Teacher/Mentor. Shared responsibilities for project implementation with P.B
	Maude PERRIER CAMBY	International project manager	Organisation of the implementation of EME3 Master - Member of EM3E Management Office UPS
ICT Fundamentals of Technologies and Modeling	Karel BOUZEK	Professor	Member of the Executive Board - Coordinator of the semester S2 in Prague. Member in admission and examination commitee - Teacher/Mentor.
	Vlastimil FILA	Assistant Professor	Member of the Evaluation Committee in charge of relationships with industries and cooperation programme of Master. Teacher/Mentor
	Hana OPATOVA	Head of the international Department	Organisation of the implementation of EME3 Master - Member of EM3E Management Office ICTP
UTwente Energy and Environment	Henny BOUWMEESTER	Associate Professor	Member of the Executive Board -Coordinator of semester S3 in Twente- Teacher/Mentor. Member of the Evaluation Committee in charge of monitoring of the quality aspects. Member in admission and examination committee -Teacher/Mentor.
	Matthias WESSLING	Department Head, Chemical Engineering	Member of the Executive Board - shared responsibilities with HB. Teacher/Mentor
	Karin F. PAARDENKOOPER	Head International Office	Member of EM3E management office
UNIZAR Nanoscience and Nanotechnology	Reyes MALLADA	Associate professor	Member of the Executive Board Coordinator of the semester S3 in Zaragoza. Member in admission and examination committee - Teacher/Mentor. Member of the Evaluation Committee in charge of information and promotion of the Master.
	Joaquin CORONAS	Professor	Teacher/Mentor. Shared responsibilities with RM
	Eva PASTOR	Head International relations Office	Organisation of the implementation of EME3 Master - Member of EM3E Management Office UNIZAR
UNL Biotechnologies, Food and Health	Joao CRESPO	Professor	Member of the Executive Board - Coordinator of the semester S3 in Lisbon.
	Maria A. REIS	Vice President of the Scientific Council - Associate Professor	Member in admission and examination committee - Teacher/Mentor
	Carla BRAZINHA	International project manager	Member of the Evaluation Committee in charge of the sustainability plan Organisation of the implementation of EME3 Master - Member of EM3E Management Office UNL

Scholars mobility contribution to the project:

During the EM3E integration week, staff members from each of the partner universities, who have an official role in the programme will participate and give presentations. External staff from associated partners and international experts on membrane engineering will be also invited to this event. Meetings of boards and committees and boards in charge of the management of the master EM3E (see later in section A3.1) will be organised during this period.

Experts from the consortium or out of the consortium will be involved to give specific lectures or will be in charge of one part of the different courses in semesters S1, S2 and S3. They will also participate to the committees in charge of the evaluation of the individual projects (S1, S2 and S3) and of the master thesis (semester S4).

In order to minimise the cost of such mobility activities, we will couple as well as possible meetings (for EM3E or for other co-operation programs) and teaching activities. Videoconferences and e-learning tools will also be used (see later in section A4.6).

A.1.6 Explain the EMMC **interaction with the professional socio-economic/scientific/cultural sectors** concerned.

Professional, scientific and cultural sectors are strongly involved in EM3E as they will actively participate to the students' courses, training, evaluation and placement. The non-educational actors of these sectors are represented by the consortium associated members such as the EMS[4] and EMH[5], but also industrialists and experts from the North America Membrane Society or the Membrane Society of Japan. The EM3E management structure (see later in section A3.1) includes an **Evaluation Committee** and an **External Quality and Evaluation board**, in which these sectors will be strongly committed by providing advises and requests concerning the courses but also giving highly specialised lectures, supervision of individual projects and/or of internships during the fourth semester (S4).

The EMH and EMS for example represent a valuable link between EM3E and the industrial companies, small and medium-sized enterprises or larger ones. They will use their knowledge of the different professional sectors to encourage the students' work placement or internships but they may also provide them financial supports by means of scholarships and grants either for their training period or their full degree. Specific grants may also be delivered by the EMS to allow students to interact directly with scientists and industrials by participating to European Conferences, where the promotion of exchanges between students and professionals are strongly present.

The industrialists who are dedicated to support the EM3E are committed to offer internships, training vacations and job positions at different levels of the curriculum but also to provide financial supports and grants or scholarships depending on their possibilities (see Appendix 2).

The strong interaction between scientists and industrials is completed by an important relationship with different social and cultural sectors with the objectives of providing students not only scientific and professional skills but also a cultural knowledge. The networking between students and the non-educational sectors will be promoted by the E-learning platform (see later in section A4.6), favouring social and informal learning that should be of interest for industrialists, researchers, teachers and students (video of plenary session of conference, thesis, and life long learning contents...), the EM3E website (www.em3e.eu) and leaflet.

Other cultural sectors will be represented by the students associations to develop strong interactions between students and the non-educational sectors by organising social events to gather people or through the preparation of a newsletter (it would be also inserted in the regular newsletter of EMS) or the development of a forum on the EM3E website with the students' job or internships opportunities and their travel and work experiences in the different areas and countries visited.

The EM3E course implementation is strongly highlighted by the numerous interactions between the non-educational, professional, scientific and cultural sectors and the academics to provide students the best of Education and Culture, Employment.

A.2 ***Course integration (25% of the max. score)***

A.2.1 Justify the extent to which the EMMC is organised **in a truly integrated way**.

The European Network of Excellence NanoMemPro *"Expanding membrane macroscale applications by exploring nanoscale material properties"* was co-ordinated by the French partner represented by the two laboratories involved in the coordination of the EM3E Master project, i.e. the *Institut Européen des Membranes* at the University of Montpellier (UM2) and the *Laboratoire de Génie Chimique* at the University of Toulouse (UPS).

The work package of NanoMemPro dedicated to Education has jointly developed the Erasmus Mundus curriculum in Membrane Engineering at Master level, EM3E. This Master project has emerged from collaborations between European researchers and teachers through the Network of Excellence with the objective of **long-term synergies** between European teachers, researchers, engineers, manufacturers, suppliers and end-users in order to overcome problems related to the multidisciplinary nature of the membrane science and engineering.

Courses offered in EM3E curriculum ensures a high level background to all students in Material Science ,Chemical Engineering, modelling and technologies (M1 year) and are focused during the second year on specific application fields such as **energy, environmental, water, food industry, pharmacy and**

[4] EMS : European Membrane Society

[5] EMH : European membrane House

biomedical applications in accordance with the scientific expertise of each university involved in the consortium and with the European Membrane Strategic and Business Research Agenda (SBRA) established with European industry. These different universities having an international position in the field of education and research on membranes are thus able to provide high level and up-to-date teaching and training around membrane science and engineering. The partners involved in the EM3E preparation first established tables of the teaching courses already given on membranes in their own university. The final Master architecture (Figure 1), the course contents, the suitable tracks and the location for each semester were finally discussed in the consortium through several meetings.

A.2.2 Justify the extent to which the EMMC is **recognised in participating countries** and leads to the award of an **official degree** by each of the partner institutions. Describe the type of degree(s) that will be awarded to successful students.

Integration :

The EM3E program is a fully integrated program, based on master courses at the partner universities, using existing modules and also new elements. It will have a joint student application and admission procedure. The ECTS system is commonly used at all partner universities and study elements and credit points will be recognised across the universities. The partners will provide a multiple degree (from the three universities visited during the semesters S1, S2 and S3) to students after completion of the 2-year Master. The letters of approval and the documents of recognition of national degree for all the partner universities are grouped in Appendix 6.

Recognition process :

- In France: The Master proposal must be on a specific Application Form (description of study plan, recruitment, lecturers…). The procedure for accreditation of a Master degree is : 1/ Master must be approved by the councils of the university and by the President; 2/ It must be sent to the French Ministry of Education for submission; 3/ The application is studying by an expert Commission; 4/ The Master is approved by the National Committee (CNESER). **UM2** and **UPS** have deposited a French accreditation for a joint degree in October 2008, and obtained the final agreement from the French Ministry of Education (see Appendix 6).

- In Czech Republic (ICTP): The application for accreditation of a study program must be sent to the Ministry of Education, Youth, and Sports by the university based in the Czech Republic. It must be undersigned by the rector. The application is then discussed on the next meeting of the Accreditation Commission. These are held five times a year. The accreditation must cover number of obligatory information on the specific study plan, description of the procedure of student recruitment, information on the lecturers, subject abstracts, technical background of the institutions etc.

- In Portugal (FCT-UNL): The national procedure for approving a Master degree consists of the following steps: 1/ the Master degree must be approved at the Academic Council of the Faculty, 2/ the Rectory of the University must be informed about it, 3/ the Master degree must be submitted to the Ministry of Education, Ministério da Ciência, Tecnologia e Ensino Superior, 4/ the Master degree must be approved by the Ministry, 5/ the Master degree must be approved by the Government.

- In Spain (UNIZAR): Once the University Council has verified the conformity of the programme of study to the protocols laid down by ANECA (Spanish National Agency for Quality Assessment and Accreditation), the programme of study is sent to the Agency for the evaluation report. The programme of study is assessed by a review panel consisting of experts who use the protocols to draw up a draft report on the programme of study, which will either be positive or negative, with reasons provided, together with recommendations, where applicable, for improvement. ANECA then sends the draft report to the University in order for any pleas (supporting arguments) to be made. The University has twenty days to do so. Once this deadline has passed and any pleas have been assessed, ANECA then draws up the final evaluation report, which will be either positive or negative, and it is then sent to the Universities Council. The University may appeal the verification resolution before the Board of the Universities Council.

- In the Netherlands (**UTwente)**: Currently, Dutch law does not allow a Dutch higher education institution to award a joint degree. A Dutch university has the authority to award a degree if the programme concerned is legally accredited. Accreditation is the done by the Accreditation Organisation of the Netherlands and Flanders (NVAO), which is rooted in the Dutch Higher Education Act (WHW). Its role is to accredit programmes on the basis of an evaluation by an external party. Programmes that have been accredited are listed in the Central Registry of Higher Education (CROHO in Dutch). This lists only accredited Dutch Higher Education programmes (http://www.ibgroep.nl/zakelijk/HO/CROHO/Inleiding_CROHO.asp). In December 2008, the Minister has forwarded the new Higher Education Act (WHW) to Parliament. Part of the changes proposed in this new Act involves three subjects of interest to the Erasmus Mundus Programme: joint degrees, the language of the names of programmes, and the number of credits for a Master's programme. Concerning Joint degrees, to remove obstacles in engaging international partnerships, it is proposed that joint degrees will be allowed in the future. These are degrees awarded by a higher education institution together with another

institution, to students who have successfully completed a programme for which both institutions are equally responsible. Both the Dutch and the international part of the joint degree curriculum will be accredited together and regarded as a combined programme: the Dutch university is responsible for the accreditation of the entire curriculum.

Degrees awarded :

As mentioned above, the partners will first provide a multiple degree (from the three universities visited during the semesters S1, S2 and S3) and a Diploma Supplement (see Appendix 7) to students after completion of the 2-year Master (September, year n+2). They will subsequently receive the multiple diploma by post, from each partner Institution. As indicated previously, UM2 and UPS have already obtained a French accreditation for a joint degree. Table 2 details the degrees awarded in each EM3E university.

Table 2: Degrees awarded by EM3E partner universities.

Institution	Title of degree awarded	Type of degree	Expected recognition date
UM2 UPS	Master en Ingenierie des Membranes, Master in Membrane Engineering in France	Multiple	Already recognised
ICTP	Inženýr – Ing. Master of Science – MSc	Multiple	Already recognised
FCT-UNL	Master Engenharia de Membranas, Master in Membrane Engineering	Multiple	Fall 2010
UNIZAR	Máster universitario en Materiales Nanoestructurados para Aplicaciones Nanotecnologica, Master in Nanoestructured Materials for Nanotechnology	Multiple	Already recognised
UTwente	Master of Science in Chemical Enginering	Multiple	Already recognised.

The final objective of the consortium is to offer a joint degree throughout all the universities participating from the consortium. However severe problems due to specific national rules in several countries still have to be solved before reaching this aim (e.g., in Netherlands, it will be possible from January 2011).

A.2.3 Describe the consortium **joint student application, selection and admission procedure**.

The EM3E consortium has agreed to common, transparent and objective procedures concerning the students' application, selection and admission to the EM3E master program. The establishment of a project management structure of EM3E (see later in section A3.1) has lead to the creation of specific committees with an Admission and Examination Committee, an Evaluation Committee and an External Quality and Evaluation Board to ensure the fair recruitment of the best candidates.

The common approaches and criteria for the different procedures decided by the EM3E consortium are detailed below:

Students' application procedure:

The EM3E consortium has created a dedicated website (www.em3e.eu) where the application procedure will be available and downloadable online by the students from the 15th of October of the year n-1 (i.e. the year prior the beginning of the EM3E courses) and will end two months after on the 15th of December of year n-1 Candidates will fill in the application form and submit it exclusively online. They will be allocated a personal and confidential file number and will receive an email on receipt of their application form by the head of the Admission and Examination Committee.

The procedure requires students to provide a selected track by choosing their choices for semesters 1 and 3, a detailed CV specifying their scientific and/or professional experiences and their English level and a motivation letter, both written in English. Concerning the 3rd countries candidates, they should explain their goals and interests to enrol the EM3E in Europe.

In addition, candidates are required to provide by registered mail a copy of their academic certificates stating their final classification including their rank, grade distinctions in each discipline/subject attended, accompanied with a stamped official transcript if not in English. They should also provide an official document from their last institution visited, college, university or technical school, stating the candidate's relative position in the corresponding graduation course i.e. top 5%, top 10% or top 20% of his/her Bologna 1st cycle class or of his/her bachelor's course.

Finally, 2 letters of recommendation should be sent by mail in a sealed envelop directly by the author itself. All the correspondence is to be directed to the Head of the Admission and Examination Committee not later than the 31st of December of the year n-1, preceding the beginning of the EM3E academic year.

Selection and admission procedure:

The Admission and Examination Committee is composed of 6 members from the different partner universities and is lead by the Head elected by the Committee's members for 2 years.

The Head of the Committee is in charge of collecting the students' application files and the mailed documents to ensure the files are correctly filled and then to establish a pre-selection based on the criteria detailed in Table 3 to build a first list of 45 students.

The second step of the selection procedure consists in the examination of the different applications. The

Head will therefore divide the completed files to the 6 members of the Committee to proceed to a fair examination. For this, two members of two universities will examine independently one student's file following the selection criteria listed in Table 3.

The selected students will have to be evaluated through a phone or videoconference interview in English to assess their motivation, their skills and their English level. To ensure equity between the students and a fair and homogeneous interview, a list of mandatory questions will be established and asked to the candidates by the members of the Committee.

After completion of the examination process by the members of the Committee, the Head will organise a meeting within the two first weeks of January with all the members in person or by teleconference to decide a main selection list of 30 students plus 5 on a complementary list. At this stage, a good balance in terms of the country of origin, gender, disadvantaged students must be ensured.

Once the academic year is completed, the students will have to send their results to the Head of the Committee in order to validate the selection list. The selection will end on the 10th of January of year n for category A students and on the 10th of May of year n for category B students. At this point of the procedure, students will be invited by email to connect to the EM3E website using their personal registration number to take notice of the Admission and Examination Committee selection decision concerning their application.

The final selection list will be available online after reception by the Committee of the final grades of the students or additional results from the last academic period with a deadline mid-July of year n.

To be eligible for application to the EM3E, students should fulfil the following requirements:
- Hold a Bologna 1st cycle degree or a bachelor degree in Chemistry, Physics, Materials Engineering, Chemical Engineering, Bio Engineering, related Bioscience or equivalent degrees from a College, University or Technical School with a recognised standing or alternatively, a recognised professional experience in these areas. Students in the final year of a degree may be admitted as long as they present the certificate and official transcripts before they enrol.
- Be part of category A or B students and provide a complete application forms with all the required documents and current and correct mail and email addresses to ensure a good communication between the Committee and the students.

Table 3: Pre-selection, Evaluation and Selection Criteria.

Final grade of the Bologna 1st cycle or the bachelor degree	**Grading**
In the top 5% – included in the 5% best students of the corresponding Bologna 1st cycle or the bachelor degree	5
In the top 10% –included in the 10% best students of the corresponding Bologna 1st cycle or the bachelor degree	4
In the top 20% –included in the 20% best students of the corresponding Bologna 1st cycle or the bachelor degree	3

Other Criteria	**Excellent +2**	**Good +1**	**Average +0.5**
Quality of the application file: *- CV with scientific and/or professional experiences* *- Motivation letter* *- Recommendation letters* *English level* Interview			

All partners undertake to avoid discriminations based on age, sex, political or religious criteria. The consortium promotes the participation of women and of socially disadvantaged students (via the pre-selection process). All partner universities have adopted accessibility measures for disabled students with special needs.

The selection procedures are centred upon academic excellence, which is one of the most important selection criteria. It is the responsibility of the Admission and Examination Committee to identify students suffering from socio-economic handicaps even though no specific criteria are listed. The committee will place them in priority on their lists, provided they meet the expected level of academic excellence. If selected, they will have priority to available student housing on campus. Special attention will be given to their socio-cultural integration, both in the home and host universities.

In order to ensure balanced gender participation, in the event of equality of the academic and professional application, the Admission and Examination Committee will give the priority to these candidates for equity purpose.

A.2.4 Describe the **joint examination methods and mechanisms** in place between the consortium partners to assess the students' achievements.

The European Credit Transfer and Accumulation System (ECTS) will be applied for the Master EM3E. The used grading scale will be the ECTS grading system defined in the ECTS framework by the European Commission (Table 4).

The Master EM3E is programmed over a 2-year period (4 semesters) with courses of 30 ECTS credits per semester, carrying therefore 120 ECTS credits at Master level, representative of students learning outcomes (see details in Appendix 3). The Master degree will be given to a student who has individually validated each of the four semesters (S1, S2, S3 and S4).

A semester validation will require an average grade superior or equal to E without any grade F for one of the semester's courses. The average grade for one semester will be calculated from the individual course grades weighted by the number of attributed ECTS.

An individual course validation will require a grade superior or equal to E. This grade will result from the combination of the continuous assessment along the related semester (if a continuous assessment is performed for this course) and of the mark obtained during the final examination. For the failing students (grade FX or F), a second examination session will be organised at least 6 weeks after the first examination session. The mark obtained for the second examination session will replace that from the first session (and the possible contribution of continuous assessment). The examination calendar is described in Appendix 8.

Concerning the fourth semester (S4 – Master thesis), the grade will be attributed from the assessments of the written report ($^1/_3$ of the final mark), of the oral defence ($^1/_3$ of the final mark) and of the general behaviour of the student during his internship period ($^1/_3$ of the final mark, provided by his supervisor). The oral defence in English will be done in front of a defence committee including at least one person from each university partner of the Master EM3E and the supervisor (using teleconferencing).

Table 4: Used grading scale and national grade equivalents.

GRADE	***Best***	**National grade equivalents**				
		France	**Czech republic**	**Portugal**	**Spain**	**The Netherlands**
A	10 %	20 - > 18	A	20 - > 18	10-9	10 - > 9
B	25 %	18 - > 16	B	18 - > 16	9-8	9 - > 10
C	30 %	16 - > 14	C	16 - > 14	8-7	8 - > 9
D	25 %	14 - > 12	D	14 - > 12	7-6	7 - > 6
E	10 %	12 - > 10	E	12 - > 10	6-5	6 - >5.5
FX	Fail - some more work required before the credit can be awarded	10 - > 8	FX	10 - > 8	Fail	5.5 - > 5
F	Fail - considerable further work is required	< 8	F	< 8	Fail	<5

The overall classification of the qualification or final grading scale of the students will be done at the end of the two years by the Admission and Examination Committee (see later in section A.3.1) from the average grade obtained for the four semesters. The students will obtain their Master degree with a distinction defined in Table 5.

Table 5: Final grading scale of the Master EM3E students.

Average grade	A	B	C	D	E
Distinction	Excellent	Very good	Good	Quite good	Pass

The Diploma Supplement will be delivered to students by University of Montpellier. The Diploma Supplement, jointly written by the partners in the consortium, gives details about the student and their skills acquired during his formation (see Appendix 7). It will be signed by the Head of the Executive Board (see later in section A.3.1) and delivered in September of the second year.

A.2.5 Explain how the **students' participation costs** to the EMMC have been calculated and agreed upon by the consortium.

The registration fees, including tuition fees and others participation costs, will be 8,000 €/year for non-EU students and 4,000 €/year for EU students. They were calculated considering: 1) the average value of the registration fees of Master programmes in the EM3E Universities, 2) the maximum contribution to the Master course participation cost awarded by individual Erasmus Mundus scholarships, 3) the importance of the attractiveness of European student to guarantee a cultural enrichment. The tuition fees are similar for all the students (2,000 €/year). The difference between the costs for non-EU and EU students is due to extra costs for the non-EU students for special support as e.g. visa deliverance, lectures about European culture and European HEI's organisation and administrative taxes. The other participation costs cover insurance costs, attendance at the integration week and cultural lectures and visits, library, phone and fax access, fieldwork costs, and costs related with the student support. Students will pay the registration fees in

one only place (Montpellier 2 University) and at the beginning of each year (semester S1 and semester S3).

The distribution of the fees among the partner universities will be realised as follows (see also Appendix 9):
- The tuition fees will be allocated proportionally to the number of students registered at each university for each semester.
- The other participation costs will be equally distributed to each university. The fees will be used by each university to finance a part of the functional and specific expenses for the EM3E Master (see later in section A.3.3).

A.3 *Course management, visibility and sustainability measures (20 % of the max. score)*

A.3.1 Describe the organisation of **the cooperation mechanisms within the consortium.**

The project management will be ensured by the following co-operation bodies, established within the partners, and formalised by an EM3E consortium agreement.

In order to ensure the academic co-operation an Executive Board and three committees will be established (Figure 2). The calendar of these committees meetings is detailed in Appendix 8. An EM3E consortium agreement signed by all consortium partners will be clearly established laying down the Master course academic, administrative and financial rules (see Appendix 10). All the minutes of the board and committees meetings will be published on the EM3E website. In the forum page in the website of the Master EM3E, a space will be dedicated to exchanging ideas, remarks and suggestions about the boards/committees decisions.

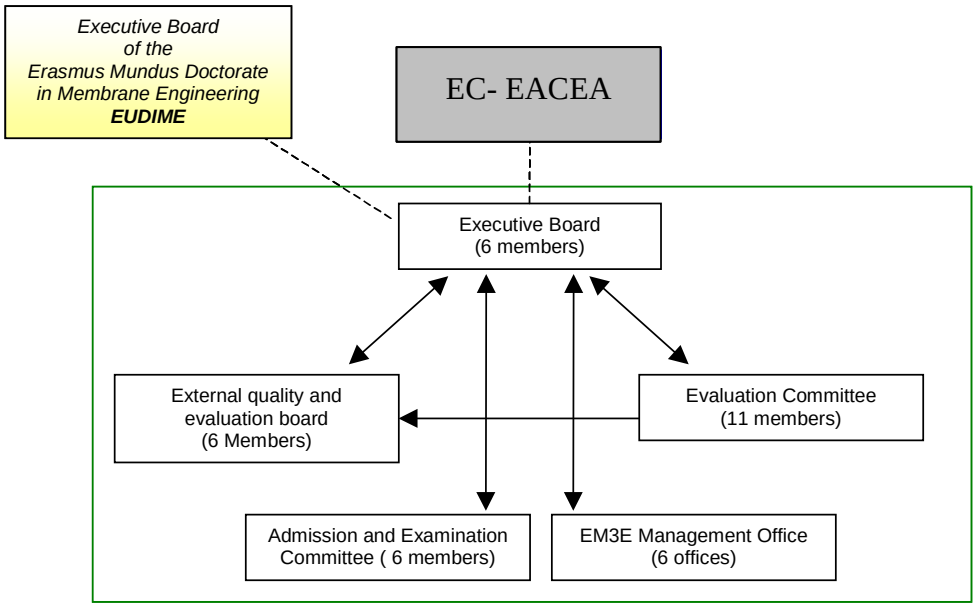

Figure 2: EM3E Management structure.

Executive Board has a highest advisory, strategic and decisional role. It is composed by the local co-ordinator of each involved institutions (one representative per university – 6 members). The head of the Executive Board is elected by its members for a period of 2 years. It gathers 4 times a year by teleconference or in one of the partner universities. The Programme Co-ordinator, member of the executive board, will insure the interface with the Executive Agency (EC-EACEA) and with the Executive Board of the Erasmus Mundus Doctorate in Membrane Engineering (EUDIME).

Admission and Examination Committee is responsible for Admission and Examination procedures and to advise Executive Board and teachers. It is composed of 1 staff member per Partner University. The head of the Committee is elected by its members for a period of 2 years. It gathers 4 times a year by teleconference or in one of the partner universities.

Evaluation Committee is co-ordinating evaluation activities and curriculum modifications and is in charge of advising the *Executive Board* and the *External quality and Evaluation Board*. It is composed of 1 staff member per Partner University and associated university and 2 students' representatives (1 first-year students and 1 second-year students). The head of the Committee is elected by its members for a period of 2 years. It gathers twice a year by teleconference or in one of the partner universities. Within the Programme Committee, each partner institution has a specific role:
- UM2 as co-ordinating institution: organisational arrangements and co-operation mechanism within the consortium.
- UPS: implementation and management of the e-learning platform.
- ICTP: relationships with industries and co-operation programme of Master.

- FCT-UNL: exploring and monitoring of extra-funding for assuring the sustainability of the Master
- UNIZAR: information and promotion of the Master.
- UTwente: monitoring of the quality aspects.
- UNICAL: assuring link with “Erasmus Mundus Doctorate in Membrane Engineering – EUDIME” and Bachelor programmes.
- K.U.Leuven: monitoring evolution of the curriculum.
- FSTM: relationship and evolution with African Third-Countries.

External Quality and Evaluation Board: this board is in charge of the external evaluation of the programme and to control the quality of the Master EM3E. It analyses the evaluations on the educational programme, courses and semester evaluation (panel discussion). Every year, it has to submit a report based on information obtained from the evaluation committee, academic staff, students, and the EM3E management office and team. It provides its feedback to the Executive Board in order to improve administrative, pedagogical and scientific quality of the Master EM3E and to define strategic developments in terms of future research trends and employment opportunities in Europe.

It is constituted by 6 representatives nominated by the executive board for 2 years: 2 industrialists, 2 external academics working in the field of Membrane Science and Engineering and 2 expert’s representative of one of the 3 following organisations: North America Membrane Society (NAMS), Membrane Society of Japan (MSJ), and European Membrane Society (EMS). An equilibrated number of representatives from Europe, North America and Asia will be respected.

The head of the Committee is elected by its members for a period of 2 years. It gathers one a year by teleconference or in one of the partner universities.

EM3E Management Office: it’s composed by 6 offices, one in each partner universities, co-ordinated by the management office in Montpellier 2 University. Each management office facilitates the implementation of the Master. It is the link between the administrative organisation of the university (international relations office, registration office, accounting service..), the students life and the Master programme (students, teachers, committees).

In each Management office, there will be a “student life co-ordinator” from the administrative staff who will be the contact person for the student services and will work in close relation with the EM3E university co-ordinator, and with the Co-ordinating management office.

The co-ordinating management office, located at Montpellier 2 University, will give assistance to the partners and will help students during their application procedure, before their arrival (visas and residence permit obtaining, planning the trip, accommodation) and during their stay (insurance, bank account opening). It is responsible for the administrative and financial management of the Master programme, the preparation of the summer school, preparation of committees, and the monitoring of the web-site.

In order to achieve an efficient communication channel between partners, a collaborative platform is being developed on the EM3E web site. It will enable to achieve an effective project monitoring and document management accessible to all the partner organisations. All the EM3E partners are already accommodate to the collaborative tools after the successfully experience of the tool used in the frame of the NanoMemPro Network.

With the active contribution of partners and associated organisations through the NanoMemPro Network, the Master EM3E starts as a real community. The step of learn through mutual exchanges and to establish sound basis of communication is almost achieved.

A.3.2 Provide information on the **partner institutions' contribution** to the EMMC and describe the way the EMMC will be managed from a **financial** point of view.

Human resources:
From all the 6 partners involved in the EM3E project, a high level and quality of resources are provided to the project. The EM3E project gathered among the most important European researchers on Membranes field. As already specified in Table 1 (see also Appendix 5 for a more detailed version of Table 1 and for the related Europass CVs), numerous of EM3E key staff involved in each partners are pre-eminent European researchers and professors in the field of membranes engineering. Administrative staff is also provided by the partner universities (except the co-ordinating office, which will be financed through the EM3E programme). In Table 6 , are reported the names of other teaching persons who will be directly involved in Master EM3E.

Table 6 : Additional list of teaching persons involved in Master EM3E.

UM2	Prof. Vasile Hulea, 4 assistant professors : Dr Damien Quemener, Dr Sophie Cerneaux, and Dr Florence Rouessac, 1 Head Research Scientist : Dr Anne Julbe.
UPS	Prof. Christel Causserand, 3 assistant professors : Dr Sylvain Galier, Dr J.C. Remigy, Dr J.F. Lahitte, Dr Hélène Roux and Dr Martine Meireles,
ICTP	Prof. Bohumil Bernauer Dr. Martin Paidar, Dr. Juraj Kosek, Dr. Dalimil Šnita, Dr. Josef Krýsa, Dr. Roman Kodým and Dr. Miloslav Lhotka.
UNIZAR	Prof Jesus Santamaría (subdirector of INA), Prof Miguel Menéndez, Dr Joaquín Coronas and Dr Pilar Pina.
UTwente	Dr. Ir. A.G.J. van der Ham, Dr. Ir. R.G.H. Lammertink, Dr. Ir. A.J.B. Kemperman, Dr. Ir. D.C. Nijmeijer, Dr. A.J.A. Winnubst and Dr. Ir. N.E. Benes.

Technical resources:

The partners have the technical capacity to ensure a successful implementation of the EM3E project. Particularly, each partner provides advanced equipment in membranes engineering and research facilities to allow the best training for all the EM3E students and scholars, and to reach the objectives of EM3E project.

Financial resources:

The financial support provide to students is organised between the different partners and managed by the co-ordinator institution (UM2). However, each of the 6 partners involved in the project will accept financial responsibility for extra miscellaneous fees in order to ensure an equal treatment of all student in each institution (see later section A.3.4).

Other support: The universities will provide office space for the co-ordinating office, for courses and research activities. The EM3E programme and students can use research facilities (such as field stations and laboratories). The general university facilities are all available for the students, such as libraries, infrastructures and sport facilities.

The distribution of the students' contribution to the participation costs among the partner universities has been already explained in section A.2.5. and detailed in Appendix 9 :

- The tuition fees will be allocated proportionally to the number of students registered at each university for each semester.
- The other participation costs will be equally distributed to each university. The fees will be used by each university to finance a part of the functional and specific expenses for the EM3E Master.

From the consortium lump sum (30,000 €/edition), Montpellier 2 University as the co-ordinating institution will receive a higher financial contribution (6,000 €/edition). The remaining amount (24,000 €/edition) will be equally divided among the partner universities (4,000 €/edition and university). The remaining expenses not covered by the fees will be covered by each university and with local support.

The EM3E consortium already takes its commitment for providing co-funding in order to ensure an equal quality of the programme between the partners in administrative, pedagogical and technical fields, and an equal treatment of all selected students.

EM3E Course implementation funding:

The organisational aspects of the EM3E programme are sustainable and do not depend only on the Erasmus Mundus contribution: they are mostly provided by the partner universities. However, the co-ordinating office, which has the most important expenses, will be financing through EU management contribution, and also by others additional institutional funding sources (National or Regional). Moreover, industries have to finance curriculum of High Education Institution. For instance, in France, it exists two different funding mechanisms: the "Taxe d'apprentissage – Training Tax" (mandatory Tax) or the "Crédit d'impôt recherche- Research and Development Tax Credit" (possibility to finance technological monitoring expenditures up to 60 000€ per year per program). The different contacted companies agree with these two mechanisms (see for instance in Appendix 2, the letter of support from CTI SA). The co-ordinator expect to recover necessary funds through these 2 mechanisms, particularly through the “Taxe d’apprentissage” (date of yearly application: each January), extra funds will be carried over each n+1 year.

Additional Students scholarships:

The Number of EU scholarships will decrease during the five editions of EM3E Master Course (see Appendix 11). The partnership have to find at least for the first year of the programme 13 additional grants for students, up to 60 per year at the end of the 5 editions.

The partners, through institutional funds and co-operation with associated organisations, will secure the necessary additional scholarships.

Each of the 6 partners guarantees at least 4 scholarships per year, by public and private funding source:

- From private organisations: Industrial companies (but also research centres and associations) who have declared their strongly support to the Master (see Letters of support in Appendix 2) will be invited to offer

scholarships to students not EU granted for the full time programme or for their training period (semester 4). As example, in Czech Republic MEGA and MemBrain (private companies) agree to finance at least 2 student grants per year.
- From the EM3E consortium: Master EM3E will offer also scholarships to European and third-country students entering the full time programme. The number of this EM3E grants will be fixed annually by the Executive Board with initially 2 grants (1 EU and 1 non-EU). These EM3E fellowships will cover half of the tuition fee. Applicants for these Consortium fellowships should make use of the usual application procedure of the programme.
- From other public funding source: National or local authorities allocate mobility grants for foreign students and for national students to study abroad. In France, Regional Council of Languedoc-Roussillon and Regional Council of Midi-Pyrénées will allocate 2 grants per year to students (all nationalities available – 400 €/month). The European students will receive the Erasmus mobility grant, through the bilateral agreements existing between partner universities.

Moreover, the partners will assist the non-European Students to find funding source possibilities. They can candidate to scholarships:
- from their own HEI,
- from their home country: some countries allow scholarships to study abroad. Information is available at the Ministry of Education or Foreign Minister of the country of origin, embassies or with the organism in charge of scholarships,
- from international organisations or Networks: allocation of scholarships of excellence. (e.g.: AUF, Egide (Eiffel grant), UNESCO, Fords Foundation, Gates Foundation, Nature, ESF),
- from local authorities of the hosting country.

A.3.3 Describe the consortium **development and sustainability plan** designed to ensure the proper implementation and continuity of the EMMC beyond the period of Community funding.

General Strategy and impact expected:

EM3E Master Course has been created by the partner organisations to develop their existing Master courses, through co-operation and joint curriculum development with HEIs in other European countries offering the same subject discipline, in the aim to propose the highest quality courses in membrane engineering.

Through the EM3E programme, the consortium expects to contribute to the **promotion of academic excellence**, in line with the aims of the "Bologna process" of strengthening the European dimension in education and promoting increased mobility, in particular by encouraging European HEIs to foster co-operation and joint working with other HEIs regarded as "world-class" in the field of membrane science and chemical engineering. The consortium expects that the reputation of the Master will increase very fast and will contribute to the promotion of the European high education system in the word. Achieving an important number of self-financing students will indicate us that the Master courses become better established and increasingly prestigious; this will help funds go further and serve as a testament to the quality and reputation of Master Courses.

It could be projected to open a fourth track in Semester S3, specifically devoted to water applications (currently S3 "Energy & Environment"). Such a new track could be for instance developed by a Third countries university with relevant expertise.

At the end of the programme, we will candidate to a new call for proposals in EMMC. In the same time, we will find different funding through industrial companies, clubs of enterprise and our associated partners, as the European Membrane House, to contribute to the sustainability of our Master.

The sustainability of the Master will be also improved by extending the programme to the PhD level (a Joint Doctorate Programme in Membrane Engineering is submitted in this same 2010 call: EUDIME). This would enable HEIs to attract and retain the brightest EM3E students beyond the confines of the current maximum 2 year duration of the Masters Courses.

Sustainability Strategy plan:

To guarantee the sustainable implementation of EM3E project, we have planed to develop strategies in:
- Implementation of an integrated curriculum and a join diploma degree, to raise the academic excellence and to increase the international visibility of the partner universities. Sharing of experience and good practices between partners on these issues will have a long-term structuring impact.
- Ensuring sustainable leadership succession and process to avoid staff loss or unavailability will prevent the reduction in the academic offering for the students. To ensure that sustainability, the universities involved will implement actions: Development of joint research teams, development of an accreditation process to maintain the quality of each EM3E members, participation of staff in different activities in the partner universities, maintain a strong institutional anchorage, maintain a critical mass in the interdisciplinary teams, develop a quality chart (updated by the Evaluation & quality committees).
- Implementing a process for leave the consortium, which guarantee the research of new excellence partners and their good integration (to be specified in the consortium agreement),

- Implementing a strategy to attract new quality partners and associated partners: leaflet and presentations will be created and disseminated to stimulate applications for membership. This strategy would be benefit for the notoriety of the programme and for the students' future academic opportunities and employability.
- Research of additional funding sources (already detailed in section A.3.2).
- Developing a co-operation strategy to reinforce the partnership and enhance new extended activities through the EM3E programme (e.g., international seminars, workshops).

Financial Sustainable plan:
The consortium is conscious that the implementation of financial sustainable plan is necessary to anticipate the decreased funding from EC during the EM3E Master Course. Different options have been explored, like: national mechanisms for funding high education & research activities and management costs, private capital from industry or funding from public organisations (already detailed in section A.3.2).

A.3.4 Describe the **course promotion measures** taken by the consortium to increase the course's (and the EM programme's) visibility and attractiveness.

In order to manage the visibility of the Master EM3E the consortium will establish two strategies: a communication strategy based on networking, and general information mainly spread by communication tools and a specific website.

To spread the general information:
By the internet network:
As specified a website will be specially created for the Master: http://www.em3e.eu. Its offers information about Master's courses, detailed explanations and links to others sources of information such as the EU Commission, HEI, European Membrane House, European Membrane Society, etc. This website will also offer an online application/registration service that will benefit students concerning all the formalities and that will give detailed explanations on procedures to be followed for example. The website will be updated periodically to offer reliable information to students.

Furthermore, the website visibility will be relay on the partners' University website, and more specifically in the International Relations section and study offers section of their website to enhance the international dimension of the Erasmus Mundus master's courses.

A link to the EM3E website will be added on the website of the associated partners such as student association (Student associations within the different Universities, Erasmus Mundus Alumni EMA), associated partner universities, companies and industries.

By the e-learning platform of EM3E programme, which will be discussed in part A.4.

By the distribution of a communication tools, as posters, guide and leaflet: (see Appendix 12)
A student guide and a leaflet will be print to promote the EM3E. It contains the basic information about the course; i.e. field of study and objectives, universities/partners involved, general structure of the courses and main contents. Information about recruitment, tuition fees and scholarships it will be also available in the leaflet.

They will be available:
- in information and career advisers' centres and offices present in the partners university,
- in the main student information centres in towns,
- in the European and international education Fairs,
- in the partner laboratories in membrane engineering area through the associated network as European membranes House and the European Membrane Society networks.

The aim is to focus the information on student interested by membranes engineering but also to inform widely the European and international student community.

Communication strategy:
- Mails mailing list will be constitute to create a continuous link between all the partners of EM3E.
- Newsletter will be monthly sent to partners and people registered on the website (and also inserted in the EMS newsletter). It will spread the EM3E achievement and inform about the EM3E events such as: kick off meeting, consortium meetings, Integrate school, graduation, cultural events, etc.
- Press release will be done for all the main events regulating the Master's execution, (Kick off meeting, Summer School for student integration, calls for applicants, graduation, etc.) and relay through local and national media & press agencies from each partner's country and specialist publication on membrane engineering.
- The EM3E recent events will be relay on the News section of the partner institution's website or on the international news section so that they will be the most accessible.
- Information about calls for application will be sent to partners by the means of:
  - institutional networks and Partners (through Universities' International Relations Office),
  - scientific networks (European Membranes House and the European Membrane Society) and international scientific conferences,
  - student networks (student associations, ERASMUS MUNDUS ALUMNI network),

- partners' embassies networks.

This wide communication aims to show the transparency of EM3E activities. Furthermore Annual activity reports will be available on-line on the web site and Report of consortiums' meeting will be also available for consultation.

A.4 ***Students' services and facilities (15% of the max. score)***

A.4.1 Describe the nature of the **information (/support) provided to students** prior to their enrolment and the way this information will be delivered.

The information about the EM3E programme and Consortium will be largely provided to the potential students by means of various ways (see section A.3.4). The main of them will be the website of master EM3E giving access to all the details about the master program, the application conditions (on-line), a e-learning platform (see later in section A.4.6) and agenda but also about the expertise of the master consortium partners in term of education and research. In addition, an updated EM3E student guide and communication tools like leaflet will be yearly sent to partners (universities, international networks, embassies…) of the EM3E consortium master (see Appendix 12) for information and dissemination. The leaflet will contain information about the web site address and about the annual key-dates for selection and for the online application. Advertising will be also made during scientific and education events, fairs, membrane conferences, by means of dedicated pages in regular membrane journals and of the national education or student journals.

A.4.2 Describe the content (and, if available, provide a model) of the **Student Agreement** defining the rights and obligations of the two signing parties.

A student agreement has been already established (see Appendix 13). In order to guarantee the adequate transparency of the EM3E Master participation rules, during the registration process, it will be signed by the Consortium and student enrolled in the Master. This agreement defines clearly the mutual rights, obligations and responsibilities of both parties. It is indicated the academic, financial and administrative modalities related to the student's participation in the EM3E programme and the award and usage of the scholarship.

A.4.3 Present the **services** that will be provided by the partner institutions **to host students / scholars.**

The organisation of the services offered to the students and scholars will be coordinated by the EM3E Management office at the Montpellier 2 University and locally managed by the corresponding office in each partner university (see section A.3.1).

The welcoming and the service offer to students of the foreign students is a crucial point for the success of the learning in the Master programme. The International Offices of each partner universities will give a specific support to this Master programme. Students will find qualified people (speaking various languages) ready to help foreign students.

As soon as students will apply to the Master, the EM3E Erasmus Mundus Student Guide published by the EM3E Management office will be given to students. Students will then be aware of the necessary steps to take in order to enrol. After their acceptance in the Master, the students will get in contact with the international services of the University of Montpellier that will answer their questions on visas delivery, insurance, grants and tuition fees for housing facilities and for specific assistance (students with a family or with special needs).

For non-EU students, once he/she is admitted to the Master Programme, he/she should start the procedures to obtain a long-stay student visa with a residence permit to seek in his/her home country in the embassy/consulate of France (first semester country). Documents confirming his/her admission for two years to the Master Programme and confirmation of scholarship will be provided by the Master co-ordinator to the student. At the beginning of each semester, the procedures for obtaining the next visa will be started. The international office of UM2 and the Master Programme Management office will advise and support the student on how to obtain the visas and facilitate the procedure.

A personalised welcome will be offered for students arriving (pick up at the airport).

During the registration week, a welcome ceremony will be organised and during the week practical information will be given to students in order to:
- make the administrative steps (inscription, insurance and if necessary constitution of residence permit),
- prepare the organisation of next semesters,
- learn in the best conditions during the Master (by introducing the language policy in place and the possibility of networking, of social and informal learning, and of formal learning offered by the e-learning platform),
- have cultural activities aiming at their social integration.

During the Master, the student will have news on general practical information via the web site or for specific internal communication via the e-learning platform. Each university has its own organisation for international services. Within the consortium, a high level of organisation between these services will be required.

The student life coordinator, who is the contact person in the Management Office for the students' services in each university, will be in charge to:
- solve the problem encountered by students during their stay,
- help student to find accommodations (by reserving student room in student residencies or student hotels and by giving a list of possible accommodation in the private sector or in families),
- develop specific artistic, cultural and sporting activities for the Master student,
- facilitate the integration of the students in existing cultural offices and students associations and give information on the university, the city and the region,
- participate to discussion with other partners to ensure an equilibrated and consistent service in each university (discussion has already started to write a common "plea text" on this point).

Students will have a mentor where he/she will study in each institution of the consortium. These universities mentors will belong to the teaching staff of the university and will supervise the work of students through a teaching follow-up. Each student and his/her mentor will meet at least once a month.

More specifically, a description of student services offered by each university is presented in Appendix 14. More details are provided in the web site (menu student life /in each university). All services listed are available for candidates with a family or with special needs. Associations of Students present in all the Universities of the Consortium aim to facilitate a greater integration of its members in the university community, and to favour the development of cultural, sport, artistic and recreational activities. The Consortium is conceived as an international environment, which presents its staff and students with the challenge of being fluent in more than one language. All Universities involved, through their language centres, offers English/National Language courses taught by professional language trainers, and facilities for language study. The Student Counselling Services, present in all Universities of the Consortium, provide support and information to Master students on regulations and financial aspects related to the university life.

A.4.4 Explain the nature and coverage of the **insurance scheme** to be put in place to cover the EM students against health issues and accidents.

The co-ordinating university, i.e. Montpellier 2 University, will guarantee students health insurance scheme covering travel, accident and sickness risks during the student's stay in Europe (2 years). These insurance costs (500 €/year) are included in the participation costs and will be paid by UM2. The health insurance scheme could be adjusted to individual profiles (family cover), with different variants giving different service options.

Students after registration at the Montpellier 2 university will be registered with the French student social security and with a student mutual insurance French company for a supplementary medical insurance policy "all-inclusive healthcare" to optimally cover all eventual healthcare needs (see Appendix 15). The student will receive a European Health Insurance Card (EHIC). With this card and the student mutual, the student will benefit from the social security in all EU countries. Following the national rules, the French insurance company will be selected after a call for tender.

A.4.5 Describe the consortium **language policy.**

The official language of the EM3E programme is English. It will be the language for the training programme, the instruction, the discussion and examination. A course will be offered to complete a good knowledge of English during the first semester and the second semester.

In each university, a course of English Language and of the hosting country language, culture and civilisation will be offered and organised. The idea won't be necessary to acquire a high level of knowledge in the language of each country visited but to be able to live in the given country by knowing basic words as well as to discover its culture and civilisation.

During the three first semesters (S1- S2 and S3), courses on the national language and culture will be thus offered. Moreover, during the total period (S1-S2-S3), each student will have to be registered at least one time at one of these courses and also to make an oral presentation of his individual project in the corresponding national language.

A Level Certification will attest of the ability of students to understand and use languages they have chosen in their curriculum and in their specific work area. Certification will follow the basic ideas and spirit set-up in the UNIcert framework. (For more details see at: http://rcswww.urz.tu-dresden.de/~unicert/e/unicert.htm)"

A.4.6 Indicate the measures taken to facilitate **networking** among the Erasmus Mundus students and between these students and other students from the partner institutions.

The EM3E Programme will encourage networking in professional and social fields. During the integration week, the students will meet all the key staff of their Master programme: teachers, mentors, and researchers, with representatives of the six participating universities, including invited industrialists and scientists. In each partner university, students will have the opportunity to meet many people through socio-cultural activities, the mentoring programme and the internship in research laboratories. The students will also be encouraged to actively contribute to the EM3E Master programme, by creating an EM alumni association, organising social events and writing for the forum EM3E website or the newsletter. Specific activities will be planned to encourage networking with professionals outside the academic field. Such activities are excursions to organisations or companies, invited speakers from organizations or companies. Language courses and possible participation to other alumni associations, or for example sport activities, will help the networking between students of the partner universities.

A **platform for e-learning** (see Appendix 16) is currently developed by the partners of the Erasmus Mundus project. The trial version in which the resources will be implemented is located on http://www.em3e.eu (actual reviewer's access: username *reviewer* and password *revem3e*). The core of the platform "**The Erasmus Mundus area**" will be dedicated to students and teachers of the Erasmus Mundus Master and PhD program in Membrane Engineering. This area has several aims:
- to give to Erasmus Mundus students access to a computer-based teaching or training,
- to promote the exchange between teachers and students in the formation (a part of these exchange should lead to develop a group spirit in the Master),
- to manage learning and collaborative activities,
- to manage evaluation and self-assessment.

The platform and also teleconference facilities will be available to offer the possibility of performing collaborative activities between students and tutors (for example during the project activities). They will also be an important tool to keep the contact between the students and the teachers during the second year (i.e. during courses in semester S3 and during the Master thesis). The platform space will be linked to the website of the **Erasmus Mundus Alumni Association**.

The different resources developed for the Master course will be also used in the context of long-life learning. To do that, the platform is also developing a "**Life-Long learning area**". An access will be given to all the members of the associated partners European Membrane House (EMH) and European Membrane Society (EMS) willing to be formed to membrane engineering and to improve their practical and theoretical level in the domain. This area integrates different learning resources that are organised in theoretical and practical courses of training with a beginner, an advanced of an expert level.

As an entrance of these previous spaces, a "**Networking area**" dedicated to Social and Informal Learning space will be open to the Erasmus Mundus (Master and PhD program) teachers and students, to the EMH and EMS members, and to other European students working in membrane engineering (the database of the universities working in this area will be used as a first reference). The objectives of the area will be:
- to develop social and informal learning in the "membrane engineering" community,
- to promote exchanges between student/industrialist/researcher.

To achieve these objectives, this area will present learning materials in an informal way (compared to the formal activities in the "Life-long learning area" and in the "Erasmus Mundus area"). The learning materials will be some easy learning courses and activities, video of conferences (plenary session, general conferences), video of summer school and of thesis. The EMS which is the main organiser of conferences in membrane area in Europe is ready to participate to the project and to the realisation of these videos (see EMS letter of support in Appendix 2). A **Forum** will be dedicated to favour the exchanges and the networking between the students and the industrialist members of the EMH and the EMS (it will be an important help for students to find data for their industrial based project and also to find position at the end of their Master or thesis).

In parallel to these areas, a restricted access to members a "**Public area**" will be open for visitors and citizens. This space will present some generalities and some attractive and accessible multimedia resources. The objectives of this area are:
- to attract external people toward the Master and the PhD program but also to the EMH and EMS (allowed to access the restricted area),
- to improve citizen awareness on the membrane and their applications in the industry in Europe (the technique guide edited at the end of the NanoMemPro Network will be one of the resources).

Numerous European universities have given their intention to use this platform and to participate to its evolution by integrating learning resources (see letters of support in Appendix 2). The European Membrane Society (EMS) which is in charge in Europe of the development of the knowledge in membrane area wants also to actively participate to the platform. The European Membrane House (EMH) wishes also to be a user

of this platform to disseminate some of their activities in the transfer of technology. About financial aspects, the cost for the first development of the platform has been supported by the NanoMemPro Network. The operating costs (hosting and maintenance) when the platform will be running are estimated to be 1,500 €/year, cost that will be jointly supported by the EMS, the EMH and the Erasmus Mundus Master and PhD programs.

A.5 *Quality assurance and evaluation (10 % of the max. score)*

A.5.1 Describe the **internal evaluation** strategy and mechanisms in place.

Quality control will be carried out both internally and externally in order to improve semester after semester the Master Course. The Internal evaluation will be performed by establishing a Quality Chart with objectives and achievements in terms of Course quality and evaluation, Teaching quality and evaluation, Management quality and evaluation. The Internal Evaluation process will provide twice a year to the External Quality and Evaluation Board the required information for the EM3E evaluation.

According to the EM3E management structure described in the section A.3.1 (Figure 2), the internal evaluation of the Master will be done by the Evaluation Committee. This committee will be in charge of preparing the assessment of the teaching units. A questionnaire addressing the evaluation of the courses (lectures, case studies…) will be established on the basis of already existing documents in each country. It must be mentioned that the members in this committee include 2 students' representatives in sort that they will participate actively to the preparation of the questionnaire. All universities will share the same questionnaire to assess the EM3E teachings.

Before to give the questionnaire to the students, a staff member from the Evaluation committee will explain in oral the importance of this questionnaire for the Master improvement and also will give briefly some information about the tract followed by the questionnaire from the student to the External Quality and Evaluation Board.

The questionnaire will be filled anonymously by the students at the end of each semester. A free space will be offered to the student in the form to collect any comment not covered by the proposed questions.

Once filled, the documents will be collected by the head of the Evaluation committee and transferred both to the Executive board and to the External Quality and Evaluation board for evaluation.

Together with a questionnaire, it is proposed to offer an anonymous space into the private area of the EM3E website to collect any comment regarding the teaching quality. The posted comments will be collected, moderated and viewed only by the head of the Evaluation Committee, before to be transferred to the External Quality and Evaluation Board.

This regular self-evaluation will be done by students and teachers involved in delivering course as well as course co-ordinators. It will ensure that quality is continuously assessed during the 5 first years of operation of courses.

A.5.2 Describe the **external quality assurance** envisaged.

Additionally, the Master EM3E will be subjected to quality assessment with an external dimension in order to ensure that course quality is maintained throughout the 5 first years of operation of the courses. The External Quality and Evaluation Board is composed by external academics and industry managers working in the field of Membrane Science and Engineering (see section A3.1). This board will evaluate the results of questionnaires (intake and exit) filled in by the students for assessing what is expected from the Master program and the evaluation of the students at the end of the program. The questionnaires will take into account not only academic aspects, but also, infrastructure and organisational aspects of the Master. These documents will be available online for all persons involved in the Master (committee's members, teachers, students, EACEA). The Quality and Evaluation Committee will also evaluate the success of the Master program in terms of employment after graduation on a short term basis. During two meetings at the middle and the end of each academic year, the feedback from the External Quality and Evaluation Board will be given to the Executive Board.

The role of this External Committee is not only to evaluate the Courses, Teaching and Managing Quality of the EM3E but also to give its feedback on the EM3E to help its improvement through the years.

Quality control will be also implemented in each partner university, by the dedicated national evaluation organisation where the local master programme is accredited (e.g., AERES[6] in France).

[6] AERES : Agence d'Evaluation de la Recherche et de l'Enseignement Supérieur (« Evaluation Agency of Research and High Education» – High Education and Research Ministry of France.