

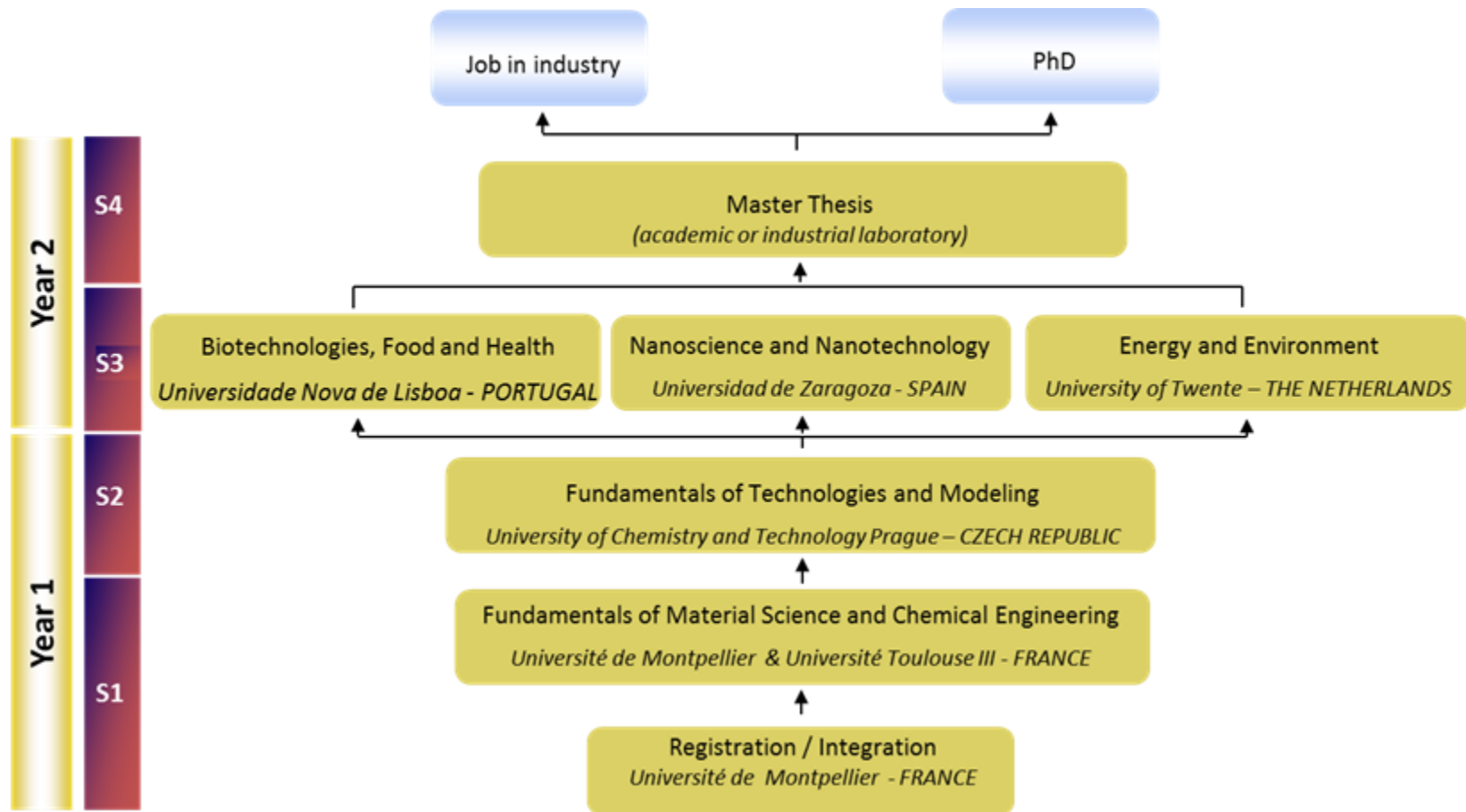


**Erasmus Mundus Master in Membrane Engineering  
for a Sustainable World  
EM3E-4SW**

**SYLLABUS**

**2017-2019**





## Content of the EM3E-4SW Master programme per semester

Semester 1: UM+UPS France (30 ECTS)			
Module 1.A.1 – 24 ECTS			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Characterization of porous materials	Mandatory	3	UM-UPS
Colloid and surface engineering	Mandatory**	3	UPS
Structural characterization of solids	Mandatory**	3	UM
Speciality 1 – Materials Science			UM
Inorganic materials	Mandatory	3	UM
Polymer materials	Mandatory	3	UM
Hybrid and composite Materials	Mandatory	3	UM
Materials for chemical reactions/ heterogeneous catalysis	Mandatory	3	UM
Speciality 2 – Chemical Engineering			UPS
Transport phenomena 1	Mandatory	3	UPS
Thermodynamics, kinetics and reactivity	Mandatory	3	UPS
General chemistry and physico-chemical analytical methods	Mandatory	3	UPS
Separation science	Mandatory	3	UPS
Individual project (bibliographic and experimental study)	Mandatory	6	UM-UPS
Module 1.A.2 – 6 ECTS			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Safety, Security, Health and Environmental requirements for a sustainable chemistry	Mandatory	2	UM-UPS
Quality Assurance and Laboratory Practice	Mandatory	2	UM-UPS
International and European Working Law and Environmental law	Mandatory	2	UM-UPS
French language and culture	Mandatory*	-	UM-UPS

(\*) Mandatory for at least one of first three semesters and associated with an oral presentation of the individual project in the corresponding national language.

(\*\*) These mandatory courses are not counted in the 30 ECTS of the semester but are counted for the semester ranking.

<b>Semester 2: ICTP, Czech Republic (30 ECTS)</b>			
<b>Module 2.1 – 24 ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Membrane processes	Mandatory	4	UCTP
Process design	Mandatory	5	UCTP
Applied reaction kinetics	Mandatory	4	UCTP
Separation Processes	Mandatory	5	UCTP
Individual project (bibliographic and experimental study)	Mandatory	6	UCTP
<b>Module 2.2 – 6 ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Czech language and culture	Mandatory*	-	UCTP
Intellectual capital management	Mandatory	3	UCTP
Valorisation, commercialisation and entrepreneurship	Mandatory	3	UCTP

<b>Semester 3: UNL, Portugal (30 ECTS)</b>			
<b>Module 3.A.1 – 30 ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Membrane contactors and bioreactors	Mandatory	6	UNL
Membranes in downstream processing	Mandatory	6	UNL
Barrier membranes for food applications	Mandatory	6	UNL
Membranes in regenerative medicine	Mandatory	6	UNL
Individual project (bibliographic and experimental study)	Mandatory	6	UNL
<b>Module 3.A.2 – - ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Portuguese language and culture	Mandatory*	-	UNL

<b>Semester 3: UNIZAR, Spain (30 ECTS)</b>			
<b>Module 3.B.1– 30 ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Fundamental properties of nanostructured materials	Mandatory	6	UNIZAR
Preparation of nanostructured materials	Mandatory	6	UNIZAR
Assembly and fabrication of nanostructures	Mandatory	6	UNIZAR
Case studies of industrial applications	Mandatory	6	UNIZAR
Individual project (bibliographic and experimental study)	Mandatory	6	UNIZAR
<b>Module 3.B.2 – - ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Spanish language and culture	Mandatory*	-	UNIZAR

<b>Semester 3: UTwente, The Netherlands (30 ECTS)</b>			
<b>Module 3.C.1 – 30 ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Electrochemistry: fundamentals and techniques	Mandatory	5	UTwente
Membranes for Gas Separation	Mandatory	5	UTwente
Multi-component Mass Transport in Water Treatment	Mandatory	5	UTwente
Membrane process plant design	Mandatory	5	UTwente
Advanced colloids and interfaces	Mandatory	5	UTwente
Individual project / Capital Selecta (bibliographic and experimental study)	Mandatory	5	UTwente
<b>Module 3.C.2 – - ECTS</b>			
<i>Course</i>	<i>Type</i>	<i>ECTS</i>	<i>Responsibility</i>
Dutch language and culture	Mandatory*	-	UTwente

<b>Semester 4: 30 ECTS</b>
<b>Module 4 - 24 weeks, research assignment in industry or university</b>