

# Master in Membrane Engineering for Sustainable Development MESD

## Erasmus Mundus Joint Master



Membrane Engineering for  
Sustainable Development



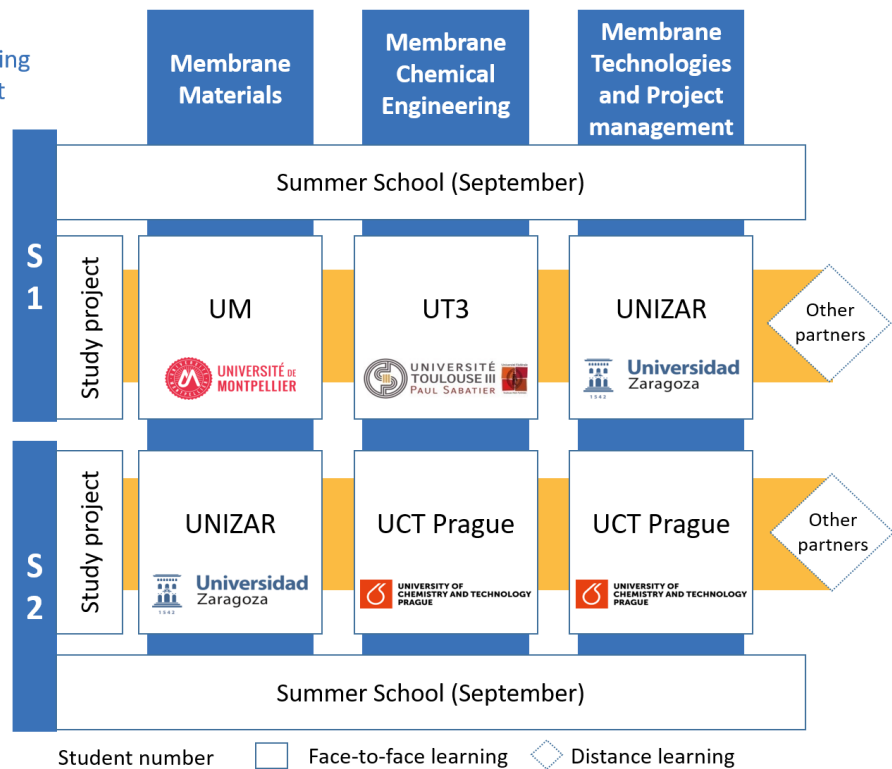
Funded by  
the European Union



## Overall architecture for the programme

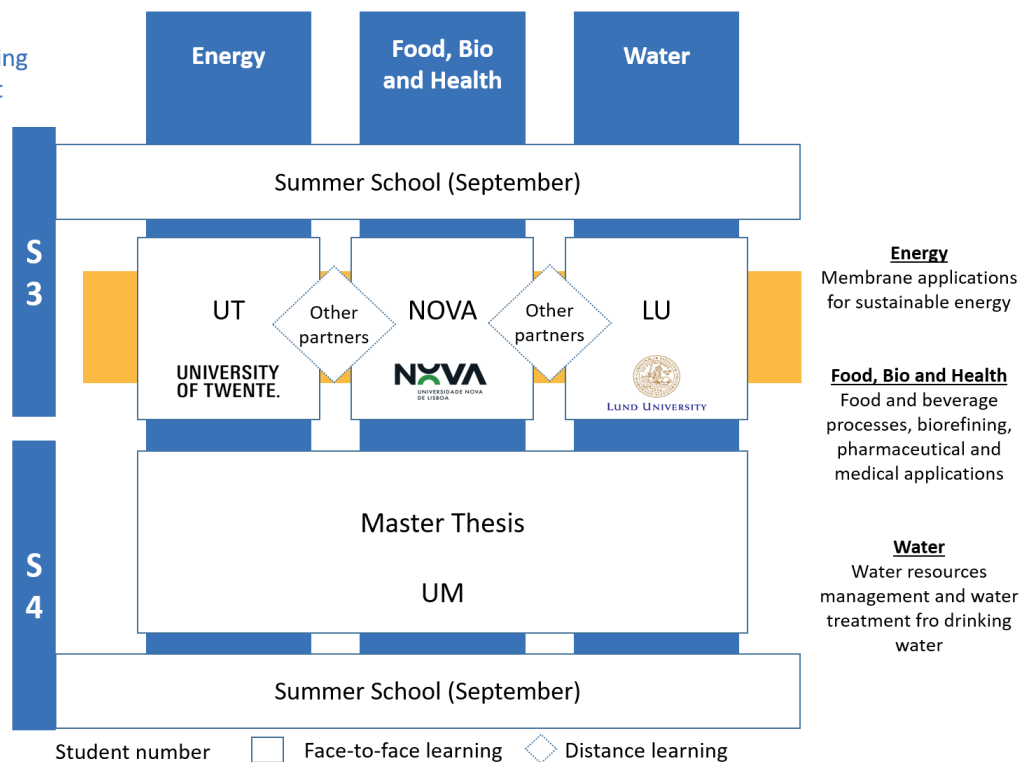
Overview of the Master in Membrane Engineering for Sustainable Development 3 specializations

1<sup>st</sup> year of Master



Overview of the Master in Membrane Engineering for Sustainable Development 3 specializations

2<sup>nd</sup> year of Master



# Master 1

Membrane Materials MemMAT (30 ECTS)			
Semester 1 - UM			
Course	Type	ECTS	Responsibility
Polymers	Mandatory	2	UM
Advanced inorganic materials	Mandatory	2	UM
Polymers and biodegradable polymers for sustainable development	Mandatory	2	UM
Characterization of porous materials	Mandatory	2	UM
Design of membrane materials	Mandatory	2	UM
Transport phenomena	Mandatory	2	UM
Influence of processing properties on the properties of materials	Mandatory	2	UM
Numerical modeling and simulations	Mandatory	2	UM
Applications of membrane technologies	Mandatory	2	UM
Tutored projects	Mandatory	8	UM
Solutions, colloids, interfaces	Mandatory	2	UM
<b>TOTAL ECTS UM</b>		<b>28</b>	
External contributions			
Introduction to nanomaterials	Mandatory On-line	2	UNIZAR
Entrepreneurship and Innovation Online Course (33ECTS UM)	Mandatory On-line	3	NOVA
<b>TOTAL ECTS SEMESTER 1</b>		<b>30</b>	
Semester 2 - UNIZAR			
Course	Type	ECTS	Responsibility
Individual Project	Mandatory	9	UNIZAR
Characterization I: Physical-chemical Techniques	Mandatory	6	UNIZAR
Characterisation II: Advanced microscopies	Mandatory	6	UNIZAR
Fabrication of micro and nanodevices	Mandatory	5	UNIZAR
<b>TOTAL ECTS UNIZAR</b>		<b>26</b>	
External contributions			
Hybrid and structured materials	Mandatory On-line	2	UM
Thermal and mechanical properties	Mandatory On-line	3	NOVA
<b>TOTAL ECTS SEMESTER 2</b>		<b>30</b>	
<b>TOTAL TRACK</b>		<b>60</b>	

<b>Membrane Chemical Engineering MemENG (30 ECTS)</b>			
<b>Semester 1 - UT3</b>			
<b>Course</b>	<b>Type</b>	<b>ECTS</b>	<b>Responsibility</b>
Transport phenomena	Mandatory	3	UT3
Separation Science	Mandatory	6	UT3
Colloid and surface engineering	Mandatory	3	UT3
Life cycle analysis, Security, norm and risk	Mandatory	3	UT3
Bioseparation science	Mandatory	3	UT3
Project	Mandatory	6	UT3
Practical Labs	Mandatory	3	UT3
<b>TOTAL ECTS UT3</b>		<b>27</b>	
<b>External contributions</b>			
Entrepreneurship and Innovation Online Course	On-line	3	NOVA
<b>TOTAL ECTS SEMESTER 1</b>		<b>30</b>	
<b>Semester 2 - UCT PRAGUE</b>			
<b>Course</b>	<b>Type</b>	<b>ECTS</b>	<b>Responsibility</b>
Membrane Processes	Mandatory	4	UCT PRAGUE
Process Design	Mandatory	5	UCT PRAGUE
Individual Project 2	Mandatory	7	UCT PRAGUE
Applied Reaction Kinetics	Mandatory	5	UCT PRAGUE
Human Resources Management Systems	Mandatory	6	UCT PRAGUE
Valorisation, Commercialisation and Entrepreneurship (Could be shared by 2-3 tracks S2)	Mandatory	3	UCT PRAGUE
<b>TOTAL ECTS UCT PRAGUE</b>		<b>30</b>	
<b>TOTAL ECTS SEMESTER 2</b>		<b>30</b>	
<b>TOTAL TRACK</b>		<b>60</b>	

<b>Membrane Technologies and Project Management (30 ECTS)</b>			
<b>Semester 1 - UNIZAR</b>			
<b>Course</b>	<b>Type</b>	<b>ECTS</b>	<b>Responsibility</b>
Organizations and their human resource management	Mandatory	4.5	UNIZAR
Industrial and R&D project management	Mandatory	6	UNIZAR
Economy and Industrial Organization	Mandatory	6	UNIZAR
Ecodesign and life cycle analysis	Mandatory	3	UNIZAR
Team project	Mandatory	7.5	UNIZAR
<b>TOTAL ECTS UT3</b>		<b>27</b>	
<b>External contributions</b>			
Entrepreneurship and Innovation Online Course	On-line	3	NOVA
<b>TOTAL ECTS SEMESTER 1</b>		<b>30</b>	
<b>Semester 2 - UCT PRAGUE</b>			
<b>Course</b>	<b>Type</b>	<b>ECTS</b>	<b>Responsibility</b>
Membrane Processes	Mandatory	4	UCT PRAGUE
Process Design	Mandatory	5	UCT PRAGUE
Individual Project 2	Mandatory	7	UCT PRAGUE
Applied Reaction Kinetics	Mandatory	5	UCT PRAGUE
Human Resources Management Systems	Mandatory	6	UCT PRAGUE
Valorisation, Commercialisation and Entrepreneurship available in MemENG (Could be shared with the other tracks)	Mandatory	3	UCT PRAGUE
<b>TOTAL ECTS UCT PRAGUE</b>		<b>30</b>	
<b>TOTAL ECTS SEMESTER 2</b>		<b>30</b>	
<b>TOTAL TRACK</b>		<b>60</b>	

## Master 2

Energy (30 ECTS)			
Semester 3 - UT			
Course	Type	ECTS	Responsibility
Advanced colloids & Interfaces	Mandatory	5	UT
Multicomponent mass transfer	Mandatory	5	UT
Membranes for gas separations	Mandatory	5	UT
Membrane process plant design	Mandatory	5	UT
Electrochemistry: Fundamentals & Technology	Mandatory	5	UT
Capita selecta	Mandatory	5	UT
<b>TOTAL ETCS UT</b>		<b>30</b>	

Food, Bio and Health (30 ECTS)			
Semester 3 - NOVA			
Course	Type	ECTS	Responsibility
Membranes in Food Applications and Biorefinery	Mandatory	6	NOVA
Membranes in Biomedicine	Mandatory	6	NOVA
Business Project	Mandatory	6	NOVA
Engineering Project	Mandatory	6	NOVA
Membranes in Downstream Processing	Mandatory	6	NOVA
<b>TOTAL ETCS NOVA</b>		<b>30</b>	
<b>TOTAL ECTS SEMESTER 3</b>		<b>30</b>	

Water (30 ECTS)			
Semester 3 - LU			
Course	Type	ECTS	Responsibility
Integrated Water Resources Management: International Aspects VVRF01	Mandatory	7.5	LU
Water and Wastewater Treatment	Mandatory	7.5	LU
Project Course Part I	Mandatory	7.5	LU
Project Course Part II	Mandatory	7.5	LU
<b>TOTAL ETCS LU</b>		<b>30</b>	
<b>TOTAL ECTS SEMESTER 3</b>		<b>30</b>	

<b>Master Thesis (30 ECTS)</b>			
<b>Semester 4</b>			
<b>Course</b>	<b>Type</b>	<b>ECTS</b>	<b>Responsibility</b>
Research assignment in industry or university (24 weeks)	Mandatory	30	UM
<b>TOTAL ECTS UM</b>		<b>30</b>	
<b>TOTAL ECTS SEMESTER 4</b>		<b>30</b>	
<b>TOTAL MASTER 2</b>		<b>60</b>	