Erasmus Mundus Master Course in
Chemical Innovation and Regulation

Annual Report 2013

for the Meeting of the Programme Committee

Universidade do Algarve

June 5, 2013

UAlg
UNIVERSIDADE DO ALGARVE

Universitat de Barcelona

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

HERIOT WATT
UNIVERSITY

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Summary

This report summarizes the results of the EMMC-ChIR project to be presented to the Programme Committee. The Programme Committee is the highest management structure in the organization of the EMMC-ChIR project. It includes representatives of the partner Universities, of the students, the lecturers, the research supervisors, and representatives of the chemical industry and regulatory bodies, as course external stakeholders.

The report is intended to be the basis for the discussion and approval of the list of modules and research topics for the next edition of the course. The annual report for the Programme Committee typically provides a brief description of the project, of its results in the previous editions and of the plans for following editions. The first edition of the course will start in 2013, so the present report provides only information on the selected students and the planning for the next year.

Introduction

What is the EMMC-ChIR?

The Erasmus Mundus Master Course in Chemical Innovation and Regulation - EMMC-ChIR - is a MSc degree for professionals concerned with the safety and regulation of chemical substances. It was created in 2012 by the consortium of universities in Portugal, Spain, Italy and Scotland: University of Algarve, University of Barcelona, University of Bologna and Heriot-Watt University.

Why the EMMC-ChIR?

Chemicals are everywhere, are an essential component of our daily lives and definitively contribute to the well-being and prosperity of our society. However, some chemicals can severely damage our environment or health and are dangerous if not properly used. A large number of substances have been manufactured and placed on the market in Europe for many years, sometimes in very high amounts, and yet there is insufficient information on the hazards that they pose to human health and the environment.

These are some of the reasons that make a sound chemicals management and regulation so important. Policy frameworks are being implemented around the world and should be in place by year 2020. These frameworks are in accordance with the recommendations of the UN's Strategic Approach to International Chemicals Management (SAICM). Among international regulations such as the US's Toxic Substances Control Act (TSCA) and Japan's Chemical Substances Control Law (CSCL), the European REACH regulations, implemented in 2007, are the most ambitious. The REACH regulations (EC 1907/2006, REACH - Registration, Evaluation, Authorization and Restriction of Chemical substances) are

recognized internationally and have been adopted and adapted by the main trade partners of the EU such as China.

The REACH legislation allows for the gathering of scientific information (registration and evaluation) and applying preventive risk management measures (authorization and restriction) of all chemicals manufactured or imported to EU. European manufacturers and importers of chemical substances are required to provide extensive information regarding all potential hazards caused by chemical substances contained in their products. This affects European and non-European companies supplying the European market and it requires an extensive amount of research from public and private research centers in order to assess the toxicity of chemical substances and to design new safer alternatives to their use.

The EMMC ChIR - Erasmus Mundus Master in Chemical Innovation and Regulation - provides professionals with all the tools and knowledge needed from the scientific, the regulatory and the economic point of view to manage the risks of chemicals responsibly and to meet responsibilities over chemical legislation worldwide. As an Erasmus Mundus project, ChIR aims to promote research and collaboration in the EHEA supporting the implementation of chemical safety regulations.

Who are the partners?

The EMMC-ChIR is managed by the consortium of universities University of Algarve (UAlg), University of Barcelona (UB), University of Bologna (UniBo) and Heriot-Watt University (HWU). The UAlg coordinates the project in its first five years. After this period a different European partner will coordinate.

In addition to the universities above (full partners), the project involves Associated Partners. The roles of the academic and non-academic associated partners include one or more of the following:

(i) promoting the course among potentially interested companies and individuals;

(ii) contributing to the self-evaluation and improvement of the course;

(iii) hosting students for part of their research theses.

The following entities currently contribute to the EMMC-ChIR project as associated partners:

- NILU - Norsk Institutt for Luftorskning (Norway), www.nilo.no
- CQE - Centro de Química Estrutural (Portugal), http://cqe.ist.utl.pt/
- CIQA - Centro de Investigação em Química do Algarve (Portugal), http://www.ciqa.ualg.pt/
- CBME - Centro de Biomedicina Molecular e Estrutural (Portugal), http://www.cbme.ualg.pt/
- USP - Universidade de São Paulo (Brazil)
- CSU - Central South University (China), http://www.csu.edu.cn
- HNU - Holy Names University (USA), http://www.hnu.edu/
- Lab*S - Red Espanola de Laboratorios Sostenibles (Spain), http://www.fundacionmaite.org/labs
- GRISC - Governance Risk Research Center (Spain), www.grisc.cat
- SEQUI - Sociedade Espanola de Quimica Industrial e Ingenieria Quimica (Spain), www.sequi.es
- SPQ - Sociedade Portuguesa de Química (Portugal), www.spq.pt
- VALAGRO S.p.A (Italy), www.valagro.com
- CEFIC - European Chemical Industry Council - (Belgium) (awaits agreement of cooperation)
- ECHA - European Chemicals Agency (Finland) (including EMMC-ChIR as part of ECHA's graduate Scheme)

New associated partners from stakeholders of EMMC-ChIR are welcome. New associated partners will be proposed and approved annually in the meeting of the Programme Committee.

At this moment, the following entities are proposed to be included as associated partners:

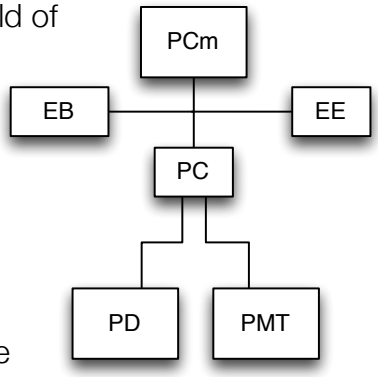
- Hokkaido University (Japan), http://www.oia.hokudai.ac.jp/
- RAIZ - Instituto de Investigação da Floresta e do Papel (Portugal), http://www.raiz-iifp.pt/

How is the project managed?

The **Programme Coordinator** (PC) has overall responsibility for the programme working in close collaboration with the **Programme Management Team** (PMT). This team includes an academic representative from each of the full partner universities. The post of **Programme**

Director (PD) rotates to lie within the University hosting the taught component of the degree in any one year.

The proposal of policy developments, academic standards and any fundamental issues affecting course delivery, including the approval of the list of modules, research topics and inclusion of new partners is the responsibility of the **Programme Committee** (PCm). The PCm meets at least once a year to review the implementation of policy, development of the programme and quality assessment results (including student feedback). It is also responsible for the annual review of the programme. The membership of the PCm comprises: the PC; all members of the PMT; representatives and observers from collaborating organisations to ensure the courses retain relevance to the "world of work", namely representatives of associated partners including ECHA; student representatives (1 representative for every 10 full-time students); a representative module leader and a project supervisor.



The **Examiners Board** (EB) is responsible for the quality assessment of the project. It consists of representatives from the four European Universities. The EB meets annually to elaborate the annual report based on the quality indicators of the master including student and lecturers feedback, complaints, student's performance, research results, previous reports. The report evaluates the course, the actions and the mechanisms put forward by the consortium to reach the objectives established previously by the PCm, from the point of view of their effectiveness and efficiency. The report from the EB is presented to the PCm and is used as the basis for new decisions on the development of the course.

The **External Examiner(s)** (EE) attend annually to ensure quality and consistency.

The **Selection Committee** is responsible for the evaluation and ranking of the EMMC-ChIR candidates. It consists of a minimum of one member of staff from each European institution, chosen to balance the different disciplines being considered. The selection committee organizes a confidential, fair and equitable evaluation of each proposal according to the criteria applicable, in full respect of the relevant procedures, rules and regulations. They ensure that the process runs smoothly and fairly, that access to the information pertaining to proposals is strictly controlled and that the most efficient use is made of the time of all concerned.

Programme Coordinator: Isabel Cavaco (UAlg)

Programme Director 2013/14: Isabel Cavaco (UAlg)

Programme Management Team:

Isabel Cavaco (UAlg)
Daniel Sainz (UB)
Emilio Tagliavini (UniBo)
Teresa Fernandes (HWU)

Selection Committee:

Isabel Cavaco (UAlg)
Ana Rosa Garcia (UAlg)
Daniel Sainz (UB)
Emilio Tagliavini (UniBo)
Paola Galletti (UniBo)
Teresa Fernandes (HWU)

Examiners Board:

(To be defined by the PMT)

External Examiners:

Alice Newton (UAlg)
Isabel Pérez (Lab*S)

The Students

Selection Procedure

EMMC-ChIR students apply online filling an extensive application form available from the project webpage: www.emmcchir.org. Candidates are carefully evaluated and ranked by a Selection Committe of representatives from the four European Partner Universities. The selection procedure and criteria is the same for all candidates.

Eligibility conditions are:

1) holding a high education diploma issued by a competent High Education authority attesting the completion of a degree equivalent to a 1st cycle (180 ECTS), in a field where Chemistry plays an important role. This may be a degree in Chemistry, Biology, Pharmaceutical Sciences, Biochemistry, Environmental Engineering, Chemical Engineering, Food Engineering, Clinical Analysis, Medicine, etc.

2) command of English language - the candidate must prove he/she can understand, speak and write English proficiently enough to take the majority of modules, which are taught in English.

In addition, eligibility conditions established by the European Commission for Erasmus Mundus grants may apply.

Ranking criteria are:

A. Quality of previous qualifications - evaluates the academic curriculum of the candidate: previous degrees, post-graduate courses, specialization courses, scientific publications.

B. Proficiency in languages of the consortium, particularly English.

C. Motivation and Potential - measures the benefit to the candidate from the Master.

D. Suitability - match between the candidate's profile and the Master. Appropriate professional experience is evaluated.

E. Recommendations - based on the confidential evaluation of the candidate by two referees.

Each criterion A-E is scored 0-5. Only very high quality candidates, with all criteria above 4, are accepted to the course.

Accepted candidates are ranked by order of merit. The higher ranked candidates are considered for Erasmus Mundus studentships.

Erasmus Mundus Student Applications 2013

Each year, The European Commission provides a limited number (n) of Erasmus Mundus grants. The n top ranked candidates are selected for the main list of candidates. Geographical balance and gender balance restrictions apply: not more than 2 candidates may come from the same country, and not less than 40% must be female candidates. To comply with these restrictions some candidates may be removed from the main list and replaced by the next ranked candidates in the reserve list.

For the first edition of the course a total of 178 complete applications were received between October and December 2012. 87% of these applications came from 3rd-country applicants (Category A), while only 3% came from European candidates, or candidates who had previously lived in Europe (Category B). Figure 1 represents the geographical distribution of candidates.

The European Commission provided 19 Erasmus Mundus student grants: 13 for 3rd-country students (category A) and 6 for European students (category B). From the 13 category A grants, 3 are reserved to special windows: 1 specific for Western Balkan Countries and Turkey, 1 for Eastern Neighboring Countries and 1 for South Neighboring Countries. The remaining ten are general category A grants.

The top ranked candidates fulfilling geographical and gender balance received Erasmus Mundus grants. Four candidates declined the grants, which were offered to the following ranked candidates in the reserve list. As a result, and because of the fewer number of candidates for category B grants, geographical balance was exceptionally not observed, and 4 candidates from Spain were accepted.

Gender distribution among candidates was skewed towards male candidates, with only 25% female candidates. This is due to the contribution from Ethiopia, Pakistan, Nigeria and Uganda, from which candidates are almost exclusively male. One the other hand, candidates from China, Ukraine, Spain and Mexico and predominantly female. Gender balance was monitored in the selection of candidates for EM studentships, and as a result the main list contains 42% (8) female students.

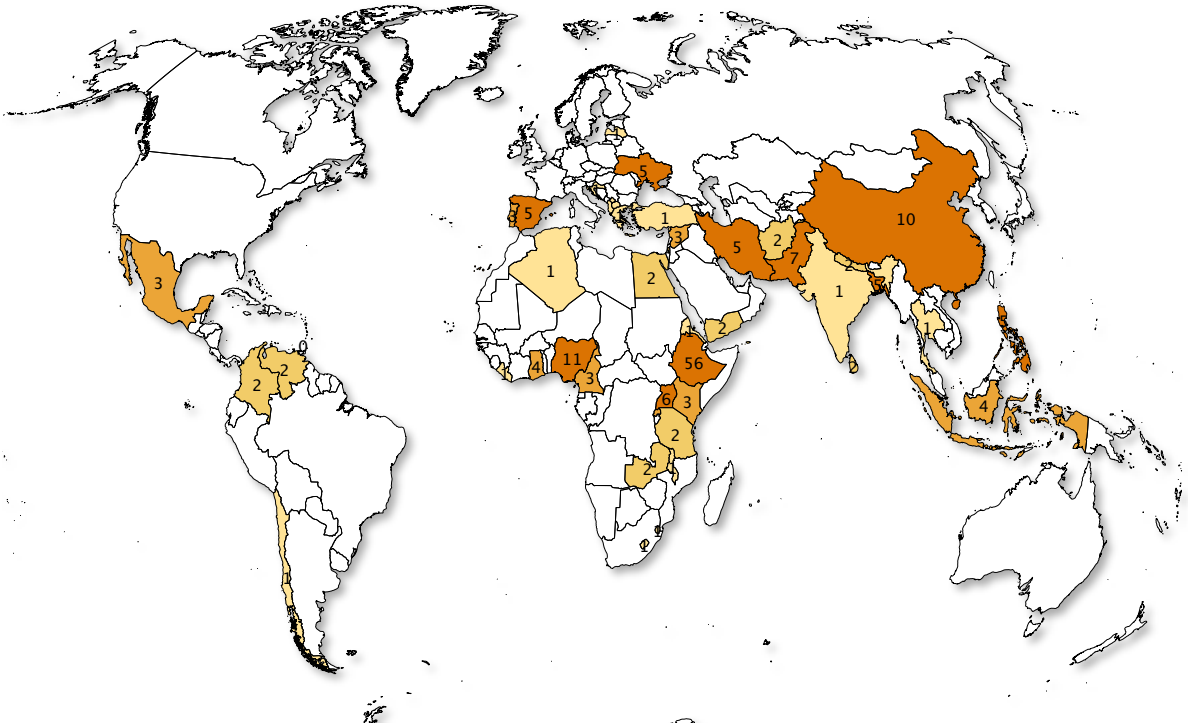


Figure 1 - Geographical Distribution of Erasmus Mundus candidates for ChIR 2013-2015

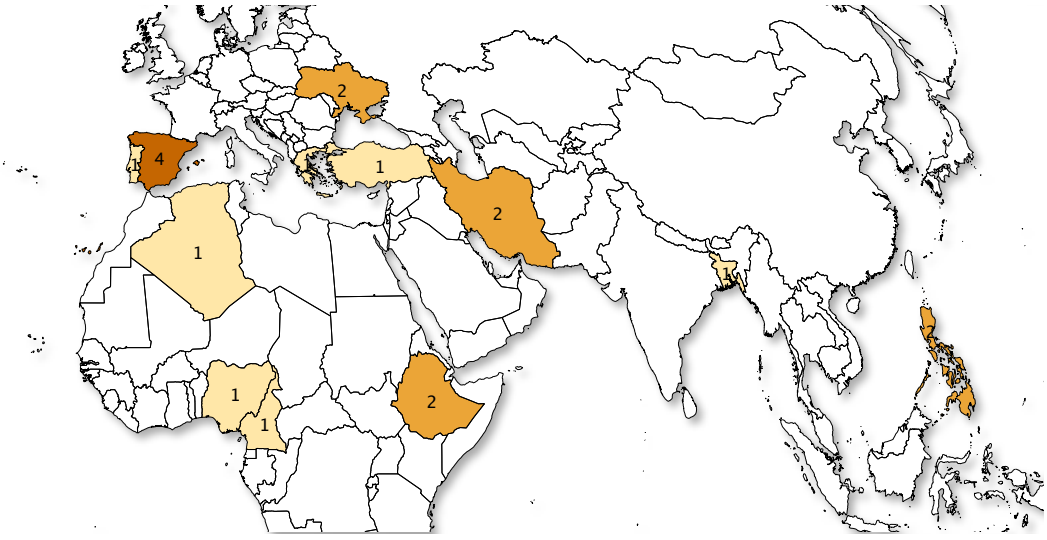


Figure 2 - Geographical Distribution of Erasmus Mundus students selected for ChIR 2013-2015 main list. Selected students come from

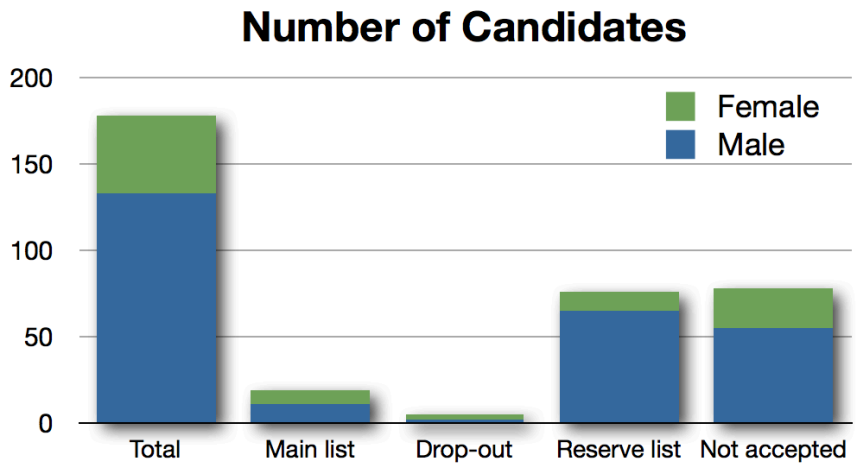


*Figure 2 - Gender Distribution of Erasmus Mundus candidates for ChIR 2013-2015: **Total** number of candidates, Candidates selected for the **Main List**, Candidates declining the studentship (**drop-out**), candidates in the **reserve list** and candidates **not accepted** to the course.*

The Scholars

Teaching Staff from the EU partner universities

The following staff from (or regularly collaborating with) each partner university will collaborate in the first edition of EMMC-ChIR:

HWU	UAlg	UniBo	UB
Thomas Aspray	Alice Newton	Alberto Modelli	Albert Moyano
Teresa Fernandes	Ana Rosa Garcia	Assimo Maris	Angels Sahuquillo
Tony Gutierrez	Helder Mota-Filipe	Claudio Trombini	Anna de Juan
	Isabel Cavaco	Dario Braga	Anna Garcia
	João Paulo Lourenço	Emilio Tagliavini	Carme Gonzalez
	José Paulo Pinheiro	Fabrizia Grepioni	Daniel Sainz
	Vera Ribeiro Marques	Fabrizio Passarini	Eliseo Ruiz
		Giuseppe Falini	Gabriel Aullon
		Laura Tositti	Helena Xuriguera
		Marco Bandini	Jaume Valls
		Marco Lombardo	Jordi Ignes
		Paola Galletti	Josefina Quirante
		Pier Giorgio Cozzi	Miquel Vidal
		Walter Cabri	Mónica Martinez
			Pilar Ramirez de la Piscina
			Santiago Alvarez
			Santiago Esplugas
			Xavier Guardino
			Xavier Saurina

Erasmus Mundus Scholars

The European Commission provides a number of Erasmus Mundus scholarships for selected non-European scholars who will contribute to the project by teaching and/or supervision of students. The following names have been proposed as ChIR Erasmus Mundus scholars for 2013-2015:

Paolo Ricci is Professor at Holy Names University (USA); Adjunct Professor at University of MA (Amherst), School of Public Health; Visiting Professor at Xiamen University (PR China); Professor at University of Bologna (Italy). He has worked on environmental economics, sustainable development in China, public finance, probabilistic decision models applied to environmental and energy choices, technological diffusion and innovation, probabilistic causation, linear and non-linear applied statistical models, industrial systems analysis, as well as at the intersection between science and law via causal analysis. He also has studied the human health risks from nuclear and non-nuclear energy technologies, from the cradle to the grave; cancer and other toxic effects from exposure to airborne and waterborne contaminants and microbiological agents. Dr. Ricci currently teaches environmental economics, statistics, decision analysis micro and macroeconomics, public finance, and sustainable resources management; he has published 5 books (Prentice-Hall, Pergamon Press, Springer) and has been published in Science, J. American Medical Association, J. Australian Medical Association, ES&T, Environment Internat., and many other major journals as well as Law Reviews. Dr. Ricci is an Associate Editor of Environment International.

Susana Etcheverry is Professor of biochemistry at National University of La Plata, Argentina and senior researcher in CEQUINOR (Inorganic Chemistry Center- National Research Council (CONICET) Argentina and National University of La Plata, Argentine). She studies pharmaceutical applications and citotoxicity of transition metal complexes. Since 2000 she has published ca. 50 peer-reviewed papers and five chapters in book on the bioinorganic chemistry of transition metals. She has experience in Erasmus Mundus, teaching three modules in the European Master in Quality in Analytical Laboratories from 2009 to 2011.

Laura Turci is a Chemical Engineer, a graduate from Universidad Tecnologica Nacional in Argentina, is a project manager at the Center for Chemical Process Safety (CCPS). Prior to coming to CCPS Mrs. Turci specialized in chemical process safety and the analysis of process thermal hazards for the pharmaceutical industry (Sanofi-Aventis). She has experience with lab research and development, process scale-up, pilot plant and manufacturing

operations related to new product development in the consumer products and pharmaceutical industry.

Scott Berger joined CCPS in 2001 after 23 years in industry. Scott holds SB and SM degrees in Chemical Engineering from the Massachusetts Institute of Technology and has a more than 30 year career working in and with industry to foster and develop "greener" and "inherently safer" technologies. Scott began his career at Rohm and Haas where he held a range of positions in R&D, engineering, production, and Environment, Health and Safety. He then worked at Owens Corning where he held positions in Environment, Health and Safety, including Director of Strategic EHS management, before coming to the Center for Chemical Process Safety. Scott is a Fellow of the American Institute of Chemical Engineers.

The Structure

General Learning Outcomes

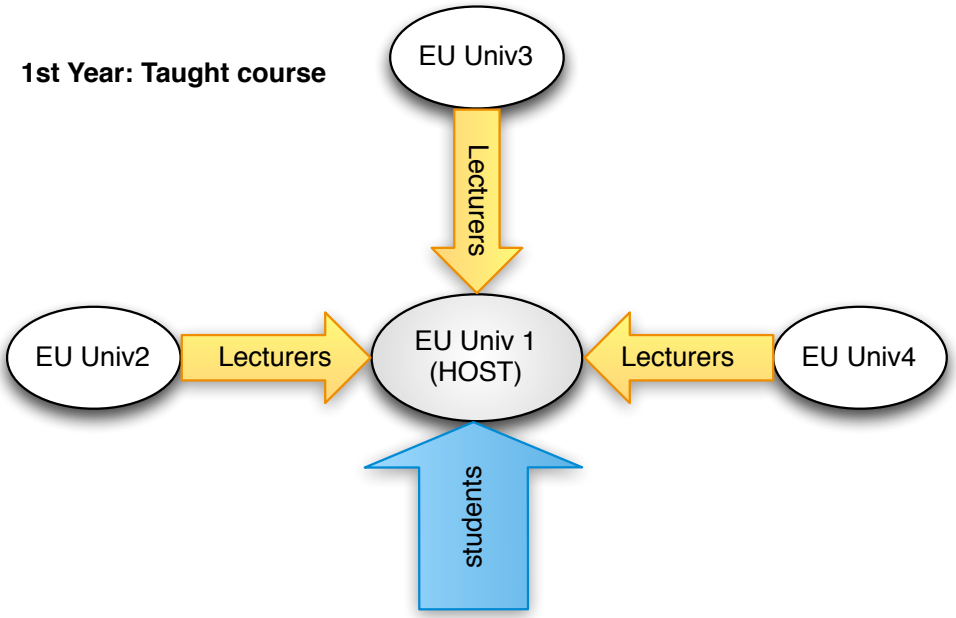
The General Learning Outcomes define the knowledge and abilities that students are expected to have gained when completing the course.

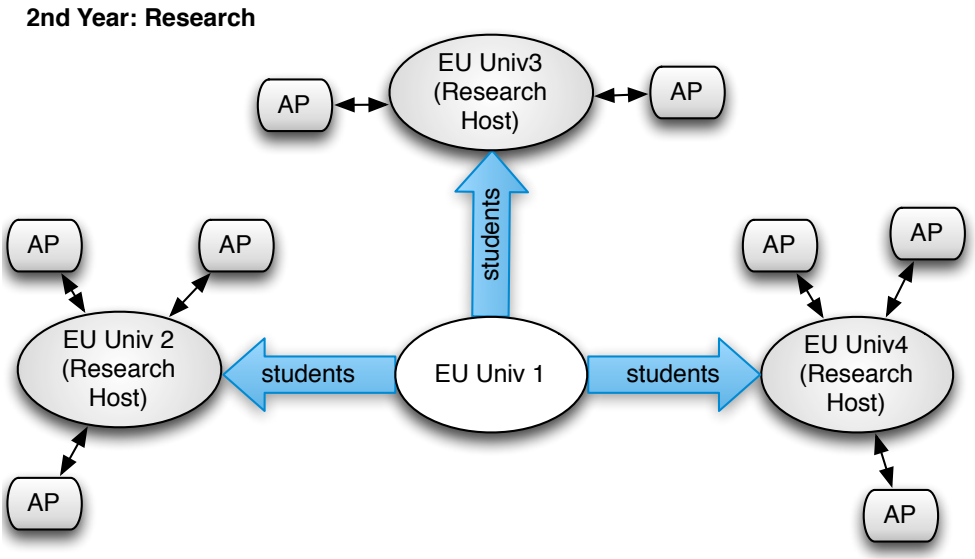
The EMMC-ChIR allows students to reach the following general learning outcomes upon its successful completion:

1. have a thorough understanding of international regulations on the use of chemical substances, namely the registration, evaluation and authorization of chemicals;
2. understand the principles behind the design of new safe chemical products;
3. project a business plan for the commercialization of new chemical products;
4. understand the principles behind the industrial implementation of new processes;
5. evaluate potential environmental hazards of chemical substances;
6. evaluate potential toxicological hazards of chemical substances;
7. evaluate potential physical hazards of chemical substances;
8. evaluate potential chemical reactivity hazards of chemical substances;
9. understand the global economy from the chemical industry perspective.

Structure

The Masters course has a total of 120 ECTS. There are two main components: first a fully integrated taught (Curricular) part of 60 ECTS credits (one year); second a research project leading to a thesis dissertation of 60 ECTS credits (one year). The course is hosted in turn at the European member institutions in subsequent years.





Contents

Staff dealing with the regulation of chemicals need an integrated, interdisciplinary view of the lifecycle of chemical substances: the **Design**, including the most recent technology for the production of alternative materials; the **Industry**, including a solid understanding of the current economy of chemical industry and the requirements for implementation of new

processes; the **Market**, including understanding the social perception of the risk of chemicals; the **Assessment**, including a deep understanding of the mechanisms of environmental and human toxicity of chemicals and of the most advanced techniques to evaluate it; and the **Regulation**, including a thorough knowledge of European and non-European legislation related to the use of chemicals.

The EMMC ChIR covers these five fields essential to understand chemical regulation. The course is organized into five large disciplines, within which a number of stand-alone modules is offered:

D - Design

I - Industry

M - Market

A - Assessment

R - Regulation

Students can build a tailored study plan by choosing modules to complete each discipline. All modules are optional and each student may choose them freely, provided he/she takes a minimum of 3 modules from each discipline and that his/her choices fulfill all the General Learning Outcomes of the course.

The same modules are not necessarily offered every year, but a sufficient number and variety is offered to allow the completion of the General Learning Outcomes.

The list of modules is proposed every year by the Programme Management Team and approved by the Programme Committee.

The Modules

For the academic year 2013-2014 the EMMC-ChIR consortium proposes the following list of modules. The corresponding descriptors can be found in Annex A.

Each module takes one week and is worth 2 ECTS credits, i.e. about 50 h of student workload including classes (~10-20 h), periods of self study (~30-20 h) and preparation for examinations (~10 h). Examinations take place within one month of the week of classes. Type of examinations vary and may include an assignment, report, presentation, etc.

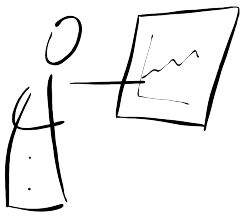
D - Design

code	Name of module	University	Name of lecturer
D01	Alternative Green Products	UniBo	Emilio Tagliavini
D02	Properties of Materials and New Materials	UB	Helena Xuriguera / Mónica Martinez
D03	Patenting New Products	UniBo	Dario Braga, Fabrizia Grepioni
D04	Drug Design	UB	Josefina Quirante
D05	Structure Toxicity Relationship	UniBo	Assimo Maris
D07	Chemical Databases	UB	Santiago Alvarez / Eliseo Ruiz
D08	Modeling and Simulation	UB	Gabriel Aullon
D09	Food and Chemistry	UB	Carme Gonzalez
D10	Soft Materials	UB	Jordi Ignes
D11	Design of Chemical formulations	UB	Santiago Esplugas
D12	Synthesis and Properties of Inorganic Nanomaterials	UniBo	Giuseppe Fallini

I - Industry

code	Name of module	University	Name of lecturer
I01	*Sustainable Chemistry:*		
I0101	Renewable Sources	UniBo	Emilio Tagliavini
I0102	Green Metrics	UniBo	Marco Lombardo
I0103	Safe Reagents and Catalysts / Catalysis for a Sustainable Synthetic Chemistry	UniBo	Marco Bandini
I0104	Alternative Green Solvents	UniBo	Claudio Trombini
I0105	Green Synthetic Strategies	UniBo	Pier Giorgio Cozzi
I0106	Zeolites for Clean Chemistry	UAlg	João Paulo Lourenço
I0107	Applied Heterogeneous Catalysis	UB	Pilar Ramirez de La Piscina
I02	*Chemical and fine chemical industry:*		
I0203	Pharmaceutical and Fine Chemicals Industry	UniBo	Walter Cabri
I0204	Industrial Forgery Detection	UAlg	José Moreira
I0205	Chemical Process Safety	UB	invited lecturer(s)
I0206	Chemical Industry	UAlg	Ana Rosa Garcia / Invited lecturers

M - Marketing and Social

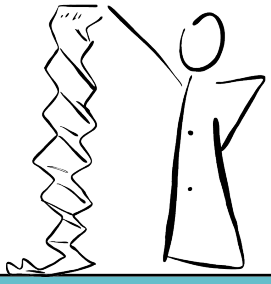


code	Name of module	University	Name of lecturer
M01	Business Planning	UB	Jaume Valls
M02	Market Research	UB	Jaume Valls
M03	Social Perception of the Chemical Risk	UB	Anna Garcia
M04	Health and Safety in Chemistry	UB	Daniel Sainz / Albert Moyano
M05	Life Cycle Assessment	UniBo	Fabrizio Passarini
M06	Quality Management	UAlg	Isabel Cavaco

A - Assessment

code	Name of module	University	Name of lecturer
A01	*Environmental Assessment*		
A0101	Chemical Transformation and Degradation in the Environment	UniBo	Paola Galletti
A0102	Chemical Pollutants (solvents. VOC,...)	UniBo	Paola Galletti
A0104	Environmental Analysis and Detection in the Environment	UniBo	Laura Tositti
A0105	Trace Metal Speciation	UAlg	José Paulo Pinheiro
A0106	Environmental and Health Safety of Nanotechnology	HWU	Teresa Fernandes
A0108	Chemical Pollutant Remediation	HWU	Thomas Aspray
A0109	Environmental Physical Chemistry	UniBo	Alberto Modelli
A0110	Marine Microbial Diversity and Ecology	HWU	Tony Gutierrez
A02	*Toxicological Assessment*		
A0201	Genotoxicity Assessment	UAlg	Vera Marques
A0202	Toxicokinetics and Toxicogenetics	UAlg	Vera Marques
A0203	Trace Metal Bioavailability	UAlg	José Paulo Pinheiro
A0204	Toxicology	HWU	Teresa Fernandes
A0206	Principles of Toxicological Assessment	Ualg	Vera Marques
A0207	Human Physiology	Ualg	Vera Marques
A03	*General Assessment*		
A0303	Estimation of Uncertainty in Chemical Analysis	UAlg	Isabel Cavaco
A0304	Reference Materials and Laboratory Proficiency Testing Schemes	UB	Angels Sahuquillo
A0305	Measuring Variability and Statistical Decision	UAlg	Isabel Cavaco
A0306	Chemometrics	UB	Anna de Juan
A0307	Sampling Strategies	UB	Miquel Vidal
A0308	Experimental Design	UB	Xavier Saurina
A0309	Guidelines for the Testing of Chemicals: Toxicology Approaches	EM Scholar	Susana Etcheverry
A04	*Physical Hazard Assessment*		
A0402	Chemical Reactivity Hazards	UB	invited lecturer(s)

R - Regulation



code	Name of module	University	Name of lecturer
R02	Risk Management	HNU	Paolo Ricci (Scholar HNU)
R03	REACH and CLP Regulations	UB	Daniel Sainz / Xavier Guardino
R04	Non-EU Regulations: Japan, Brazil and China	UB	Daniel Sainz/invited lecturer(s)
R06	Pharmaceuticals Regulations	UAlg	Vera Marques / Helder Mota-Filipe
R07	Nanomaterials and Nanotecnologies Regulations	HWU	Teresa Fernandes
R08	Chemical Waste Materials Regulations	UB	Daniel Sainz / invited lecturer(s)
R09	Priority Substances in EU Environmental Legislation	UAlg	Alice Newton
R10	Comparative Analysis of Chemical Regulations – US and EU	HNU	Paolo Ricci (Scholar HNU)

The Research Topics

During the second year of the course EMMC-ChIR students carry out one research project and thesis. This must be done mostly in a second European university of the EMMC-ChIR consortium. Research projects may be shared between two or more universities and/or a company. Students may visit more than one country during their research year, provided that during the whole course they spend a minimum of 6 months each in two different European countries of the consortium.

A list of general topics and supervisors is provided each year by the consortium of universities. Students must choose their research topic one year in advance of starting their second mobility, to allow time for visa issuing and other travel arrangements.

Research projects must be within a subject related to EMMC-ChIR. This can be on Chemical Design, Chemical industry, Marketing and Social, Risk Assessment, Regulation or any research project where students can apply the knowledge they acquired in the curricular part of the EMMC-ChIR. Research projects must be an original contribution to knowledge, and must be feasible within twelve months, including the time for writing and public defense.

The following list of research topics is proposed for the 2013-2015 edition of EMMC-ChIR:

no.	Field	Univ	Supervisor(s)	Short description
1	I	UniBo	Pier Giorgio Cozzi	Catalytic stereoselective redox reactions mediated by photocatalysis or air.
2	D	UniBo	Maris Assimo, Melandri Sonia	Molecular modeling and spectroscopic characterization of small molecular systems of biological and environmental interest
3	D,I	UniBo	ClaudioTrombini	The objective of this thesis will be the development of new synthetic and catalytic processes and their optimization as far as safety and sustainability criteria are concerned. Attention will be focused on the adoption of homogenous multiphase conditions with the aid of non traditional solvents such as water, ionic liquids, etc.
4	D,I	UniBo	Emilio Tagliavini, Paola Galletti	Use of renewable sources of materials for producing valuable chemicals and transformation of substances obtained into useful products. Among sources attention will be paid to algal sources and vegetable wastes. Both solvent extraction and thermal conversion will be applied
5	I	UniBo	Emilio Tagliavini, Paola Galletti	Development of catalytic and biocatalytic transformations in green solvents. Attention will be paid to stereoselective processes.
6	A	UniBo	Emilio Tagliavini, Paola Galletti	Development of artificial lipidic membrane system of sensing, detection or assessment of chemical substances. Polydiacetilenic acid derivatives will be the key substances of this research
7	D,I	UniBo / UNL (PT)	Emilio Tagliavini, Paola Galletti, Daniele Fabbri, (Lemos-UNL)	Innovative system for producing and recovering biopolymers using renewable carbon sources and novel solvents
8	I	UniBo / HWU	Marco Bandini, Ai-Lan Lee (HWU)	Asymmetric catalysis using safer reagents
9	D	Unibo / CQE (PT)	Fabrizia Grepioni, Dario Braga, Maria Teresa Duarte (CQE)	Multiple crystal forms of active pharmaceutical ingredients: patent implications
10	I, A	HWU/Ualg	Teresa Fernandes, Isabel Cavaco, Mendes de Sousa (RAIZ)	Evaluation of the toxicity of nanoceluloses. The project involves a period of six months for preparation of samples of nanocelulose in Portugal, in collaboration with Instituto RAIZ, and another six months for evaluation of their toxicity, which will be done in HWU.
11	A	Ualg / UB	Maria da Conceição Mateus / Santiago Espulgas	Degradation of planktonic biotoxins - eg mycrocistins, cylindropsermosin or saxitoxins - in water/sediments, using advanced oxidation technologies.
12	A	Ualg / UB	Isabel Cavaco / Patrick Gamez	Evaluation of the citotoxicity of transition metal complexes.
13	I,D	UB	Patrick Ramirez de la Piscina	Multicomponent catalysts for CO_2 hydrogenation: design, characterization and evaluation.
14	D,I,A	UB/HWU	Daniel Sainz/ Teresa Fernandes	Chiral phosphine ligands for asymmetric catalysis: assessment of ecotoxicological properties
15	I	UB	Santiago Esplugas	Chemical oxidative treatments for municipal water reuse.
16	D	UB	Carme González	Study of new textures in gastronomy
17	D	UB	Jordi Ignés	Synthesis of anisometric Janus colloidal particles and their transport in thermotropic liquid crystals

no.	Field	Univ	Supervisor(s)	Short description
18	I	UB	Pere Cabot	Degradation of organic pollutants by electrochemical advanced oxidation processes (EAOPs)
19	D,I	UB	Albert Moyano	Development of new organocatalytic processes in aequous medium
20	D,I	UB	Daniel Sainz / Arnald Grabulosa	Catalytic asymmetric hydrogenation with complexes of Ru
21	M,A	UB/GRISC	Daniel Sainz / Anna Garcia	Study of the risk perception of nanomaterials in research laboratories
22	M,R	UB/Lab*S	Daniel Sainz / To be defined	Development of a simplified method for risk assessment of laboratories
23	D	UB	Elena Xuriguera / Monica Garcia / Joan Valle / Daniel Sainz	Development of sustainable casting wax for Fine Arts
24	A	UB	Xavier Santos	Development of analytical methods for determination of emergent pollutants in environmental matrix
25	I, A, R	HWU/ ECHA/JRC (to be confirmed)	Teresa Fernandes (others to be confirmed)	Suitability of the current European legislation to manage the safety of products of Nanotechnologies
26	D, I, A, T	HWU	Teresa Fernandes	Study of trophic uptake of nanomaterials
27	D, I, A, T	HWU	Teresa Fernandes	Species and models sensitivity analysis to nanomaterials
28	D, I, A, T	HWU	Helinor Johnston, Vicki Stone	Effects of nanomaterials on the immune system
29	D, I, A, T	HWU	Helinor Johnston, Vicki Stone	Effects of nanomaterials on the skin
30	D, I, A, T	HWU	Thomas Aspray	Role of microbes in bioremediation
31	D, I, A, T	HWU	Tony Gutierrez	Study of bacterial processes that influence the bioavailability and degradation of oil hydrocarbons
32	A, M	UniBo / HNU	Elena Fabri, Paolo Ricci	Precautionary choices under uncertainty
33	A	UniBo / HNU		Evaluation of the effect of pollutants on physiological parameters in trophoblast cells, towards the evaluation of risks for human health.

In addition to the general research topics offered above, the following possibilities for research project are open in EMMC-ChIR:

- **ECHA traineeship**. ECHA traineeship (http://echa.europa.eu/web/guest/about-us/jobs/traineeships). The EMMC-ChIR participates in the Graduate Scheme by ECHA. Students may take part of their research project as a traineeship in ECHA (Helsinki).

- Traineeship with one of the **Associated Partners** - students may take a period of 3 to 9 months of traineeship in one of the Associated Partners of the consortium: NILU (Norway), CEFIC (Brussels), Valagros (Italy), Lab*S (Spain), GRISC (Spain).

- **3rd country mobility projects** - EU students may take a 3-month period mobility in one of the 3rd country associated partner universities - in Brazil (University of São Paulo), China (Central South University), USA (Holy Names University) or Japan (University of Hokkaido).

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