Erasmus Mundus Master Course in
Chemical Innovation and Regulation

Annual Report 2018

for the Programme Committee

Heriot-Watt University

September 6, 2018

UAlg UNIVERSIDADE DO ALGARVE

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

UNIVERSITAT DE BARCELONA

HERIOT WATT UNIVERSITY

Co-funded by the
Erasmus+ Programme
of the European Union

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Summary

This report summarises the results of the EMMC-ChIR course to be presented to the Programme Committee. The Programme Committee is the highest management structure in the organisation 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 provides a brief description of the project and of its results in the previous editions. It 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 present report provides information on the ongoing 4th and 5th editions.

1. Introduction

What is the EMMC-ChIR?

The EMMC ChIR - Erasmus Mundus Master in Chemical Innovation and Regulation - is a MSc providing professionals with the key tools and knowledge needed from the scientific, the regulatory and the economic point of view to manage the risks of chemicals responsibly and to address chemical legislation requirements worldwide.

The EMMC-ChIR was created in 2012 as a Joint Degree by the ChIR Consortium of European Universities. As a Joint Degree offered by the ChIR Consortium, it benefits from a much larger offer of contents and facilities than would be possible in a single university. As an Erasmus Mundus project, ChIR also aims to promote research and collaboration in the EHEA supporting the implementation of chemical safety regulations.

Detailed information is available at www.emmcchir.org .

Who are the partners?

The EMMC-ChIR is managed by the Consortium of 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 editions, 2013-2019.

In addition to the Full Partner universities above, 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:

Universities:
USP - Universidade de São Paulo (Brazil)
CSU - Central South University (China)
HU - Hokkaido University (Japan)
UPune - University of Pune (India)
Indian Institute of Science - Bangalore (India)
Universidad de La Plata (Argentina)
Universidad de La Republica (Uruguay)
Toyo University (Japan)
National institute for Materials Science (Japan)

Research Centers:
NILU - Norsk Institutt for Luftorskning (Norway), www.nilo.no
CQE - Centro de Química Estrutural (Portugal), http://cqe.ist.utl.pt/
CQFM - Centro de Química Física Molecular (Portugal), http://cqfm.ist.utl.pt
CIQA - Centro de Investigação em Química do Algarve (Portugal)
CBME - Centro de Biomedicina Molecular e Estrutural (now Center for Biomedical Research, CBMR), Portugal
GRISC - Governance Risk Research Center (Spain), www.grisc.cat

Associations:
FEIQUE - Federación Empresarial de la Industria Química Española
SEQUI - Sociedade Espanola de Quimica Industrial e Ingenieria Quimica (Spain), www.sequi.es
SPQ - Sociedade Portuguesa de Química (Portugal), www.spq.pt
APEQ - Associação Portuguesa de Empresas Químicas (Portugal)

Companies:
Caviro Distillerie SRL (Italy),
Fresenius-Kabi (Italy)
Microperi Blue Growth S.r.l. (Italy)
Endura SPA (Italy)
Metco (Italy)
Hovione (Portugal)
Polycrystalline SRL (Italy)

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

Structure

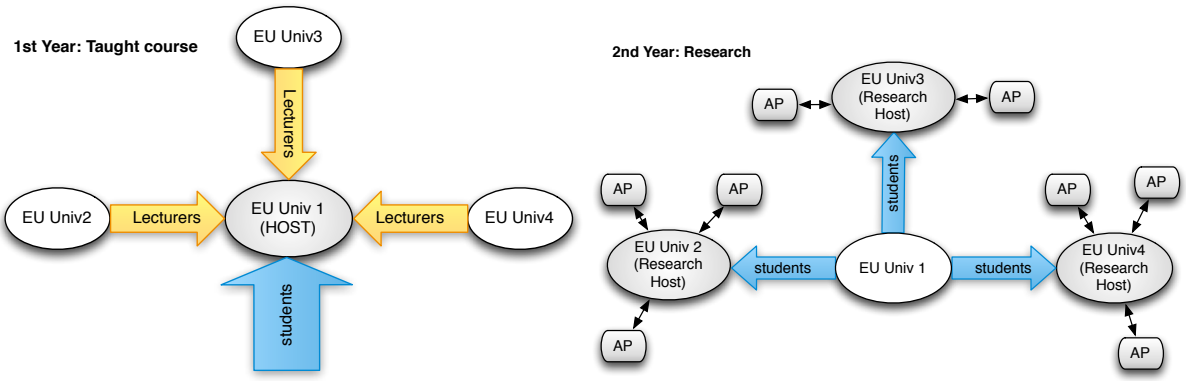
The Masters course has a duration of 2 years and comprise a total of 120 ECTS credits.

There are two main components: first, a fully integrated taught (curricular) part of 60 ECTS credits (one year). Second, a period when the research theses take place (60 ECTS credits, another year). The course is hosted in turn at the European Universities, as such:

Edition	Academic Year	Host University
1st	2013 / 2014	UAlg
2nd	2014 / 2015	UB
3rd	2015 / 2016	UniBo
4th	2016 / 2017	UAlg
5th	2017 / 2018	UB

The Consortium is preparing a new edition starting in 2019/20.

The research theses take place in any of the other European Universities of the Consortium, and may be shared with associated partners (AP).



Contents

Staff dealing with the regulation of chemicals need an integrated, interdisciplinary view of the lifecycle of chemical substances, to include: the **Design**, including the most recent technology for the production of alternative materials; the **Industry**, including a solid understanding of the current economy of the chemical industry and the requirements for implementation of new processes; the **Marketing**, 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 ChIR covers these five fields essential to understand chemical innovation and regulation. The course is organised into five large disciplines, within which a number of stand-alone modules is offered:

D - Design

I - Industry

A - Assessment

R - Regulation

M - Marketing and Social

All modules are optional and students may choose them freely, provided they take a minimum of 3 modules from each discipline and that their choices fulfil all the General Learning Outcomes of the course. The same modules are not necessarily offered every year, but a sufficient number and variety are 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.

Project Management

Programme Coordinator: Isabel Cavaco (UAlg)

Programme Director 2013/14: Isabel Cavaco (UAlg)

Programme Director 2014/15: Daniel Sainz (UB)

Programme Director 2015/16: Emilio Tagliavini (UniBo)

Programme Director 2016/17: Ana Rosa Garcia (UAlg)

Co-Directors in 2016/2017: Isabel Cavaco (UAlg), Vera Marques (UAlg)

Programme Director 2017/18: Daniel Sainz (UB)

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)
Carmen Gonzalez (UB)
Emilio Tagliavini (UniBo)
Paola Galletti (UniBo)
Teresa Fernandes (HWU)
Helinor Johnston (HWU)

Examiners Board:

Daniel Sainz (UB)
Emilio Tagliavini (UniBo)
Ana Rosa Garcia (UAlg)
Teresa Fernandes (HWU)

External Examiners:

Alice Newton
Isabel Pérez

Administrative Assistants:

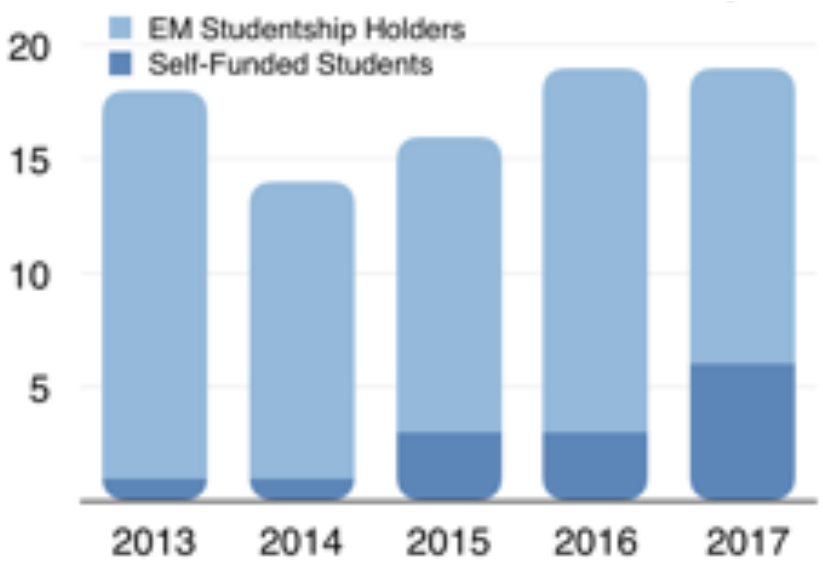
Nataliya Butenko (UAlg)

2. Students

Evolution of ChIR students

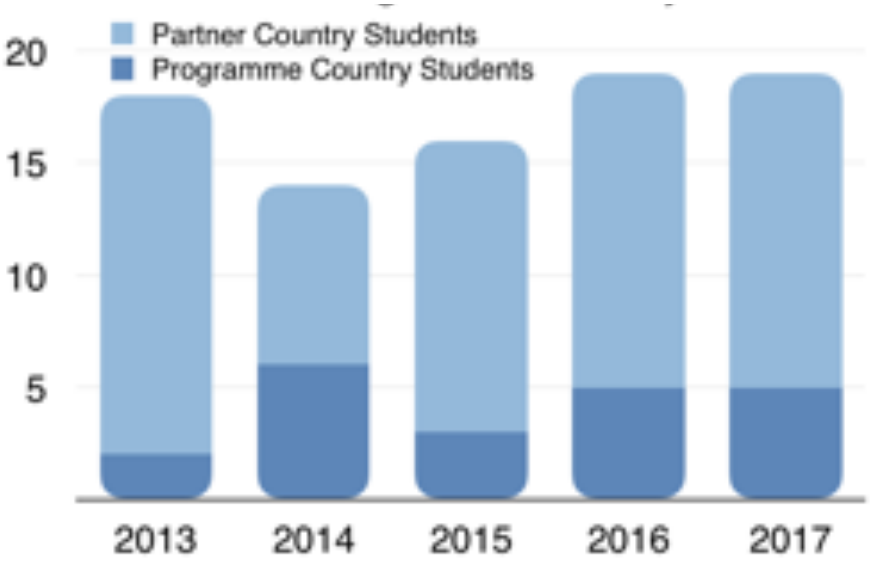
ChIR is a project funded by the European Commission through the Erasmus+/Action 1/ Erasmus Mundus Programme. The erasmus Mundus Programme was originally created to promote the European Higher Education Area and attract students from non-EU Countries. A distinction is made between “Programme Countries”, i.e. Countries participating the Erasmus+ Programme[1], and “Partner Countries”, i.e. all other countries of the world. The Erasmus Mundus Programme has since 2004 built a reputation in Partner Countries. Interestingly, there is still lack of knowledge on this Programme across the Eu. The Erasmus Mundus Programme supports a number of students each year through studentships for Partner Country and for Programme Country nationals. The number of self-funded students, initially very low, has increased gradually since the start of the project.

Graphic 1 - Evolution of Student Funding



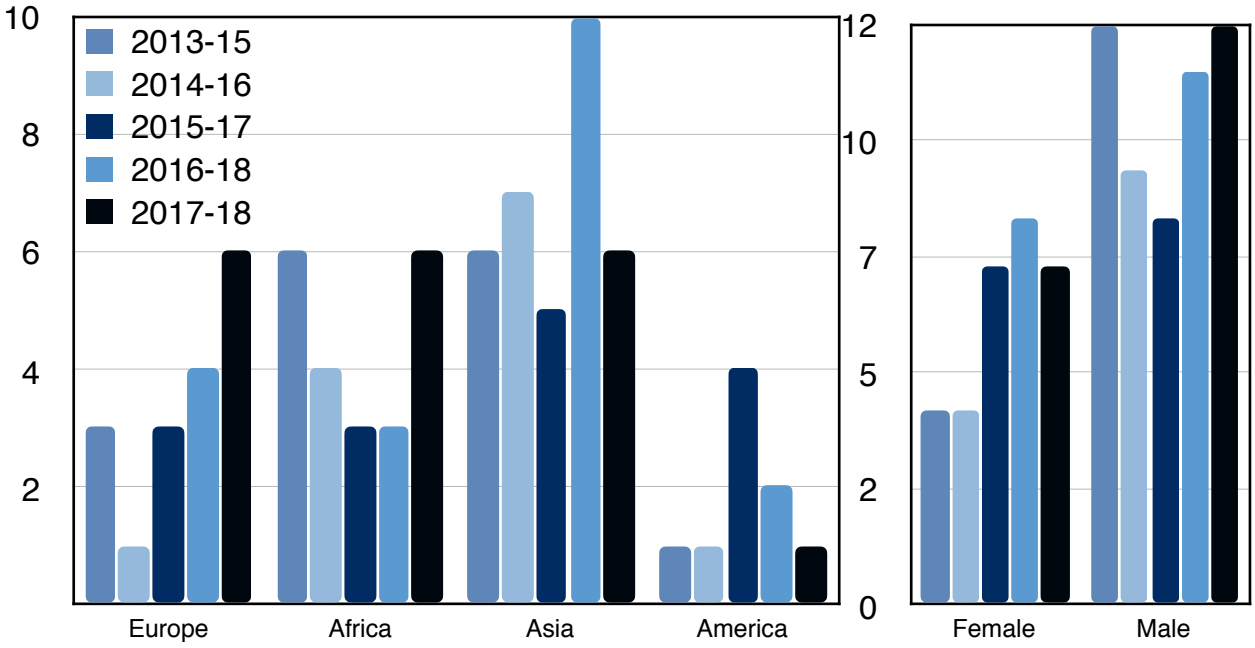
Graphic 2 - Number of Partner and Programme Country Students

[1] Currently, the following countries can participate in the Erasmus+ Programme and as such are Programme Countries: Member States of the European Union (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom), Iceland, Liechtenstein, Norway, Turkey and the Former Yugoslav Republic of Macedonia.



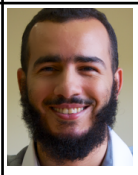
Studentships are awarded assuring geographical and gender balance. This results in a rich cultural diversity: in each ChIR edition students from Asian, African, American and European Countries share one year of common experiences studying in a foreign country, developing unique international skills.

Graphic 3 - Number of ChIR students, by world region and by gender



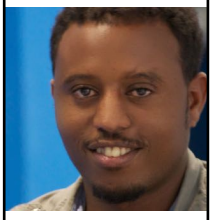
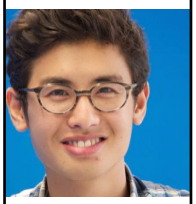
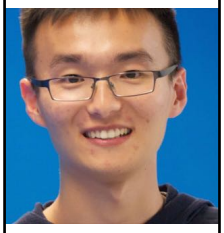
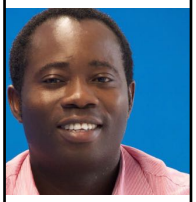
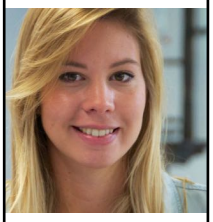
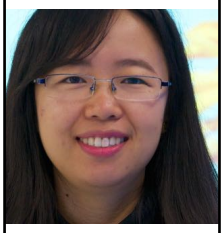
Students 2013-2015

In its first edition the EMMC-ChIR received 17 students, all Erasmus Mundus grant-holders. All but one completed the first year of classes at UAlg. Antoine Karengera, who arrived late in the academic year, was allowed to complete a few modules in the next edition in the UB.

	Antoine Karengera (Rwanda) Pharmaceutical Sciences Research: **UB and UAlg** Current position: **PhD student, Wageningen University (Netherlands)**		Jagadish Roy (Bangladesh) Chemical Engineering Research: **HWU** Current position: **PhD student, GEMTEX (France)**		Silvana Agostinho Martins (Portugal) Pharmaceutical Sciences dropped out
	Arsalan Afkhami (Iran) Chemical Engineering Research: **UB** Current position: **Watewater treatment engineer, Peyvand Ab Sepahan (Iran)**		Kateryna Vengel (Ukraine) Chemistry Research: **UB** Current position: **Quality Assurance/R&D, Galenicum Health Company. (Spain)**		Sohaib Mahri (Algeria) Pharmacy Research: **HWU** Current position:**PhD student, Université catholique de Louvain (France)**
	Emmanuel Neba Ambebia (Cameroon) Research: **UB** Current position: **Searching employment (USA)**		Maybel Monfero Nonato (Philippines) Research: **UniBo** Current position: **Science Research Specialist, Department of Energy, Philippines)**		Stavros Moschidis (Greece) Chemical Engineering Research: **HWU** Current position: **Business Analyst at Credit Suisse (UK)**
	Fabián Andrés Lara González (Chile) Chemistry&Pharmacy Research: **HWU** Current position: **Consultancy in Chemical and Pharmaceutical Regulations (Chile)**		Oleksii Shemchuk (Ukraine) Pharmaceutical Sciences Research: **UniBo** and **UAlg** Current position: **PhD student (UniBo, Italy)**		Tiruwork Mequanint Bezabih (Ethiopia) Analytical Chemistry Research: **HWU** Current position: **Searching employment (USA)**
	Gokhan Gulten (Turkey) Chemistry Research: **HWU** Current position: **Consultancy in Chemical and Pharmaceutical Regulations (Chile)**		Pauline Angelic Roxas (Philippines) Chemistry Research: **UB** Current position: **Environmental Program Manager, Land Bank of the Philippines (Philippines)**		Victor Olusola Ajao (Nigeria) Industrial Chemistry Research: **UniBo** Current position: **PhD student, Marie Curie, Wetsus, European centre of excellence for sustainable water technology (Netherlands)**
	Hintsa Gitet Kahsay (Ethiopia) Education in Chemistry Research: **UB** Current position: **Mekelle University, Lecturer (Ethiopia)**		Payam Alikhani (Iran) Petroleum Engineering Research: **HWU** Current position: **PhD student, Politecnico di Milano (Italy)**		

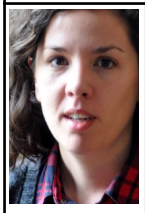
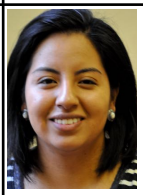
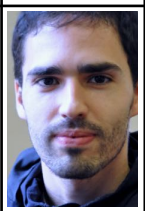
Students 2014-2016

In its second edition the EMMC-ChIR received 14 students. Thirteen Erasmus Mundus grant-holders and one self-funded students, Bethel Anucha. Isabel Navarro abandoned the course in the first semestre.

	Angelo Kenneth Romasanta (Philippines) BSc Chemistry Research: **Unibo / UAlg** *Current position:* **PhD student, VU Amsterdam (Netherlands)**		Hagos Tesfay Kidanu (Ethiopia) BSc Applied Chemistry MSc Chemistry Research: **UniBo** *Current position:* **PhD student, Taiwan (Academia Sinica research center)**		Nazmiye Tugce Eran (Turkey) BSc Chemistry Research: **HWU** *Current position:* **Searching for PhD position (Turkey)**
	Asnake Gudisa Eded (Ethiopia) BSc Applied Chemistry MSc Environmental Sciences Research: **UAlg** *Current position:* **Arba Minch University, Lecturer (Ethiopia)**		Isabel Navarro (Spain) BSc Chemistry dropped out		Paola Blair Vásquez (Costa Rica) BSc Chemical Engineering Research: **UniBo** *Current position:* **PhD student, SINCHEM, Italy**
	Bazarsad Narmandakh (Mongolia) BSc Applied Chemistry Research: **UAlg** *Current position:* **Chemical Plant (Mongolia)**		Miguel Antonio Brion (Philippines) BSc Chemistry Research: **UAlg** *Current position:* *Current position*: **Lecturer - Ateneo De Manila Senior High School, Philippines**		Yu Zhang (China) BSc Chemistry MSc Chemistry Research: **HWU** *Current position:* **PhD student, University of Barcelona (Spain)**
	Chukwuka Bethel Anucha (Nigeria) BSc Chemistry Research: **UAlg** *Current position:* **Searching for employment**		Mireia Broch Gosser (Spain) BSc Chemistry Research: **Unibo / HWU** *Current position:* **Regulatory Affairs Technician, Laboratories Maverick (Spain)**		Wei Wang (China) BSc Pharmacy MSc Chemistry Research: **UB / UAlg** *Current position:* **Access Campaign Advisor - Médecins Sans Frontières (China)**
	Donaldben Mbagag Neba (Cameroon) BSc Biochemistry MSc Biotechnology Research: **UAlg** *Current position:*		Mohammad Anisur Rahman Jamil (Bangladesh) BSc Chemistry MSc Inorganic Chemistry Research: **UniBo** *Current position:* **PhD student, Hokkaido University (Japan)**		

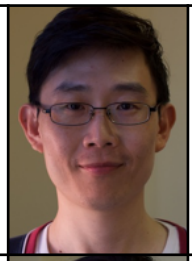
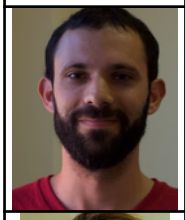
Students 2015-2017

In its third edition the EMMC-ChIR received 16 students, of which 13 were Erasmus Mundus grant-holders and 3 self-funded students: Erica Quagliarini, Diana Guillen Ferrari and Jose Miguel Albahaca Oliva. Erica Quagliarini abandoned the course in the second semestre. Peggy Montazeri joined the course but, for personal reasons, left in the beginning. She was replaced by Zohre Alughare Eskandari, who joined in January 2016.

	DJ Donn Matienz (Philippines) BSc Chemical Engineering Research: **UB** *Current position*: **Industrial PhD student, ELCOREL project**		Wubshet Belay (Ethiopia) BSc Chemistry MSc Environmental Sciences Research: **UAlg** *Current position*: **S&H Manager, Coca-Cola, Ethi**		Mulatu Yohannes Nanusha (Ethiopia) BSc Chemistry MSc Chemistry Research: **UAlg** *Current position*: **PhD Student, UFZ, Germany**
	Ester Carregal Romero (Spain) BSc Chemistry MSc Business Studies Research: **HWU** **Trainee - European Chemical Agency**		Mohammad Sufian Bin Hudari (Singapore) BSc Chemistry Research: **HWU** *Current position*: **PhD Student, UFZ, Germany**		Diana Guillen Ferrari (Paraguay) BSc Chemical Engineering Research: **HWU /UAlg** *Current position*: **Management**
	Shella Talampas (Philippines) BSc Chemical Engineering Research: **UAlg / UB** *Current position*: **Consultancy**		Yemataw Addis Alemu (Ethiopia) BSc Chemistry;MSc Pharmacy Research: **UAlg** *Current position*: **University lecturer, Debre Tabor University, Ethiopia**		Ana Vallejo Cortes (Mexico) BSc Pharmacy Research: **HWU** *Current position*: **Trainee - European Chemical Agency**
	Loveille Jun Gonzaga (Philippines) BSc Chemical Engineering Research: **UAlg** *Current position*: **University lecturer, Philippines**		Jose Miguel Albahaca Oliva (Venezuela) BSc Chemistry Research: **UB** *Current position*: **PhD Student, Catalan Institute of Water Research, Spain**		Diego Josué Milián Izeppi (Guatemala) BSc Chemical Engineering Research: **UB** *Current position*: **PhD Student, CNRS Grenoble, France**
	Erica Quagliarini (Italy) Dropped out.		Kseniia Tuholukova (Ukraine) BSc Environmental Sciences MSc Environmental Sciences Research: **UB** *Current position*: **Project Manager, Antarctic research base, Vernadsky, Ukraine**		Boryana Tsenkova (Bulgaria) BSc Chemistry Research: **UniBo / UAlg** *Current position:* **Senior Scientist - Aptuit, an Evotec Company**
	Zohre Alughare Eskandari (Iran) BSc MSc Research: **UAlg**		Pegah Montazeri (Iran) BSc Chemistry MSc Chemistry Dropped out.		

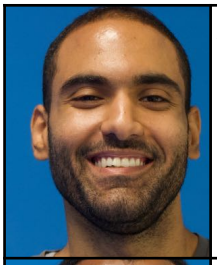
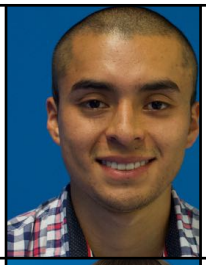
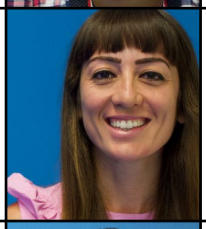
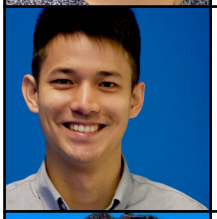
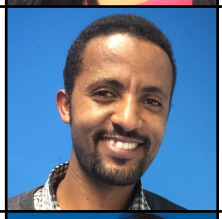
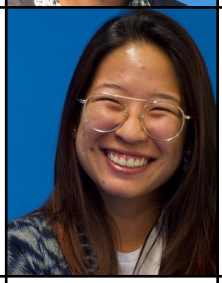
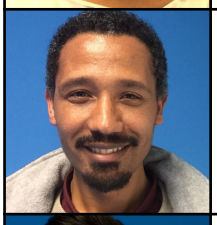
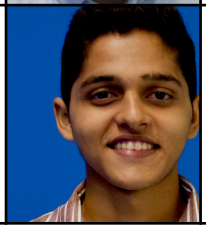
Students 2016-2017

In its fourth edition the EMMC-ChIR received 19 students. Sixteen Erasmus Mundus grant-holders and three Italian self-funded students: Anna Ciurlini, Diego Gerini and Giulia Mengotti,

	Ahmed Mashaly (Egypt) BSc Pharmacy MSc Chemistry Research: **UB**		Fadi Al-Shnani (Jordan) BSc Chemistry MSc Chemistry Research: **UB**		Napatr Kunachitpimol (Thailand) BSc Env. Sciences MSc Env. Sciences Research: **HWU**
	Ana Ligia Sandoval Pérez (Guatemala) MSc Pharmacy Research: **UB**		Gidey Gebremeskel Kidane (Ethiopia) BSc Chemistry MSc Medical Biochemistry Research: **UB**		Nazan Altun (Turkey) BSc Chemical Engineering Research: **UniBo**
	Anna Ciurlini (Italy) BSc Chemistry Research: **UniBo**		Giulia Mengotti (Italy) BSc industrial Chemistry Research: **UniBo / HWU**		Seyed Mohammadreza Hesami (Iran) BSc Chemical Engineering MSc Chemical engineering Research: **HWU**
	Askar Nurassilov (Kazakhstan) BSc Chemistry Research: **UAlg / UB**		Jose Albert Cruz (Philippines) BSc Chemical Engineering Research: **UB**		Sharmaine Atencio (Philippines) BSc Food Science and Technology Research: **UB**
	Basma Raad Shakir (Iraq) BSc Chemistry Research: **UB**		Jye Ming Ong (Malaysia) BSc Chemistry Research: **UniBo**		Dawit Gebremichael Gidey (Ethiopia) BSc Chemistry MSc Chemistry Research: **UniBo**
	Danilo Bertagna Silva (Brazil) BSc Chemical Engineering Research: **UB**		Mart Benson Castillo (Philippines) BSc Chemical Engineering Research: **HWU**		
	Diego Gerini (Italy) BSc Chemistry Research: **UniBo / UB**		Mi Nguyen Thi Diem (Vietnam) BSc Chemistry MSc Chemistry Research: **UB**		

Students 2017-2018

In its 5th edition the EMMC-ChIR received 19 students. Thirteen Erasmus Mundus grant-holders and six self-funded students: Chau Nguyen, Chen Tun-Pu, Francesco Bignami, Jacopo Monaldi, Kiram Abraham Jacob, and Lorenzo Marotti.

	Ahmed Essam Mohamed Shaban (Egypt) BSc Pharmacy Research: **UniBo / UAlg**		Francisco Javier Vega Piedras (Mexico) BSc Chemical Engineering Research: **UAlg**		Maciej Doruch (Poland) BSc in Chemical Engineering & Technology Research: **UniBo**
	Alemu Bejiga Melka (Ethiopia) BSc in Chemistry MSc in Chemistry Research: **UAlg**		Gulsah Angi (Turkey) BSc Chemical Engineering MSc Chemical Engineering Research: **UAlg / UB**		Maria Katrina Vasquez-De Paz (Philippines) BSc Chemistry Research: **UniBo**
	Chau Nguyen (Vietnam) BSc in Engineering Research: **UAlg**		Israel Alemayehu Tekamo (Ethiopia) BSc in Chemistry MSc in Chemistry Research: **UAlg**		Michelle Myla Lucas Marquez (Philippines) BSc Chemical Engineering Research: **HWU**
	Chen Tun-Pu (Taiwan) BSc Microbiology Research: **HWU**		Jacopo Monaldi (Italy) BSc in Chemistry Research: **UniBo**		Mulata Haile Nega (Ethiopia) BSc in Chemistry MSc in Chemistry Research: **UAlg**
	Christine Abey Ashaolu (Nigeria) BSc Chemistry MSc Chemistry Research: **UB / UAlg**		Kateryna Babych (Ukraine) BSc in Chemical Technology MSc in Chemical Technology Research: **UAlg**		Suthapat Sathityatiwat (Thailand) BSc Chemistry Research: **UAlg**
	Eyob Mulugeta Kebede (Ethiopia) BSc in Chemistry MSc in Chemistry Research: **UAlg**		Lorenzo Marotti (Italy) BSc Chemistry Research: **UniBo**		
	Francesco Bignami (Italy) BSc Biology Research: **UniBo**		Kiran Abraham Jacob (India) BSc Chemical Engineering Research: **UniBo**		

4. Contents

List of modules offered in 2017-2018 in UB

A total of 74 modules was offered in the 5th edition. The ChIR benefitted from the addition of a specific IT tools module dedicated to Chemical Registration, reflecting the recent needs of preparation in this field felt by industry professionals. Furthermore, a new module on Stability Testing for New Pharmaceutical was taught by Kateryna Vengel, ChIR 1st edition graduate from Ukraine who has since pursued a successful career in the Pharmaceutical Industry in Barcelona.

As in previous editions, a number of modules was cancelled because they were chosen by an insufficient number of students.

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 Polluants (solvents. VOC,...)	UniBo	Paola Galletti
A0104	Environmental analysis and detection in the environment	UniBo	Laura Tositti
A0106	Environmental and Health Safety of Nanotechnology	HWU	Teresa Fernandes / Helinor Jonhnston
A0108	Chemical Polluant Remediation	HWU	Thomas Aspray
A0111	Chemical and biological treatment of wastewater	UAlg	Clara Costa
A02	*Toxicological Assessment*		
A0201	Genotoxocity assessment	UAlg	Vera Marques
A0202	Toxicokinetics and toxicogenetics	UAlg	Vera Marques
A0204	Toxicology	HWU	Teresa Fernandes / Helinor Jonhnston
A0206	Principles of Toxicological Assessment	UAlg	Vera Marques
A03	*General Assessment*		
A0304	Reference materials and laboratory proficiency testing schemes	UB	Angeles Sahuquillo
A0305	Measuring variability and statistical decision	UAlg	Isabel Cavaco
A0306	Chemometrics	UB	Anna de Juan
A0308	Experimental design	UB	Xavier Saurina

A0309	Guidelines for the Testing of Chemicals : Toxicological Approaches	EM Scholar	Ignacio León
A0311	Stability testing for New Pharmaceutical Products	External	Kateryna Vengel
A04	*Physical Hazard Assessment*		
A0402	Chemical Reactivity Hazards	Extern	Victor Garrido

D - Design

code	Name of module	University	Name of lecturer
D01	Alternative Green Products	UniBo	Emilio Tagliavini
D03	Patenting new products	Ualg	Lurdes Cristiano
D04	Drug design	UB	Axel Bidon-Chanal
D05	Structure Toxicity Relationship	UniBo	Sonia Melandri
D07	Chemical Databases	UB	Gabriel Aullón / Arnald Grabulosa
D08	Modelling and Simulation	UB	Gabriel Aullón
D09	Food and Chemistry	UB	Carme González
D11	Design of Chemical formulations	UB	Santiago Esplugas
D12	Synthesis and Characterization of Nanomaterials	UniBo	Giuseppe Falini
D13	Sustainable biocatalytic processes	UniBo	Alessandra Tolomelli

I - Industry

code	Name of module	University	Name of lecturer
I01	*Sustainable Chemistry:*		
I0101	Renewable Sources	UniBo	Chiara Samori
I0102	Green Metrics	UniBo	Marco Lombardo
I0103	Catalysis for a sustainable synthetic chemistry	UniBo	Marco Bandini
I0104	Alternative Green Solvents	UniBo	Claudio Trombini
I0105	Green Synthetic Strategies	UniBo	Pier Giorgio Cozzi
I0107	Environmental Catalysis	UB	Pilar Ramírez
I0108	Chiral Technology in the Chemical & Pharmaceutical Industry	UB	Albert Moyano
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	External	Matteo Pori
I0206	Chemical Industry	UB	Daniel Sainz
I0207	Nanomanufactoring and Nanoprocessing	UB	Albert Romano
I0208	Plastics: Sturcture and Properties	UB	Inés Fernández

M - Marketing and Social

code	Name of module	University	Name of lecturer

M01	Business planning	UB	Jaume Argerich
M02	Market research	UB	Rubén Huertas
M03	Social Perception of the Chemical Risk	Unibo	Luca Piertrantoni
M04	Health and Safety in Chemistry	UB	Xavier Guardino
M05	Life Cycle Assessment	UniBo	Fabrizio Passarini
M06	Quality Management	UAlg	Isabel Cavaco
M07	Innovation Management	UB	Jaume Valls
M08	Biosafety	UB	Cristina Massa
M09	Entrepreneurship	UB	Jaume Argerich

R - Regulation

code	Name of module	University	Name of lecturer
R02	Risk Management	scholar	Paolo Ricci
R03	REACH and CLP regulations	External	Rosa Beaus
R04	Non-EU regulation: Japan, Brazil and China	UB	Daniel Sainz
R06	Pharmaceuticals regulations	External	Helder Mota Filipe
R07	Nanomaterials and nanotecnologies regulations	HWU	Teresa Fernandes
R08	Chemical waste materials regulations and valorizations	UB	Victor Garrido
R09	Priority substances in EU environmental legislation	UAlg	Alice Newton
R10	Comparative Analysis of Chemical Regulations – US and EU	EM Scholar	Paolo Ricci
R12	EU and US legislation	EM Scholar	Paolo Ricci
R13	Advanced Risk Analysis	EM Scholar	Paolo Ricci
R14	Safety in the use of Chemicals	FEIQUE	Eugenia Anta

T - Transferable Skills

Transferable skills modules provide an opportunity for students to train and improve skills that are useful in a wide range of fields. A maximum of three T modules can be included in a study plan.

code	Name of module	University	Name of lecturer
T01	IT tools - part I	UB	Carolina Sañudo
T03	Laboratory skills	UB	D Sainz
T06	Innovation Skills	UAlg/UB	D.Sainz/I.Cavaco
T08	Intensive "Survival" Language Course - Spanish	UB	Alessandra Montruchio
T12	Team Building	External	Martin Fussi
T13	It tools for Chemical Registration	External	Rosa Beaus

Cancelled Modules

The following modules were cancelled this year:

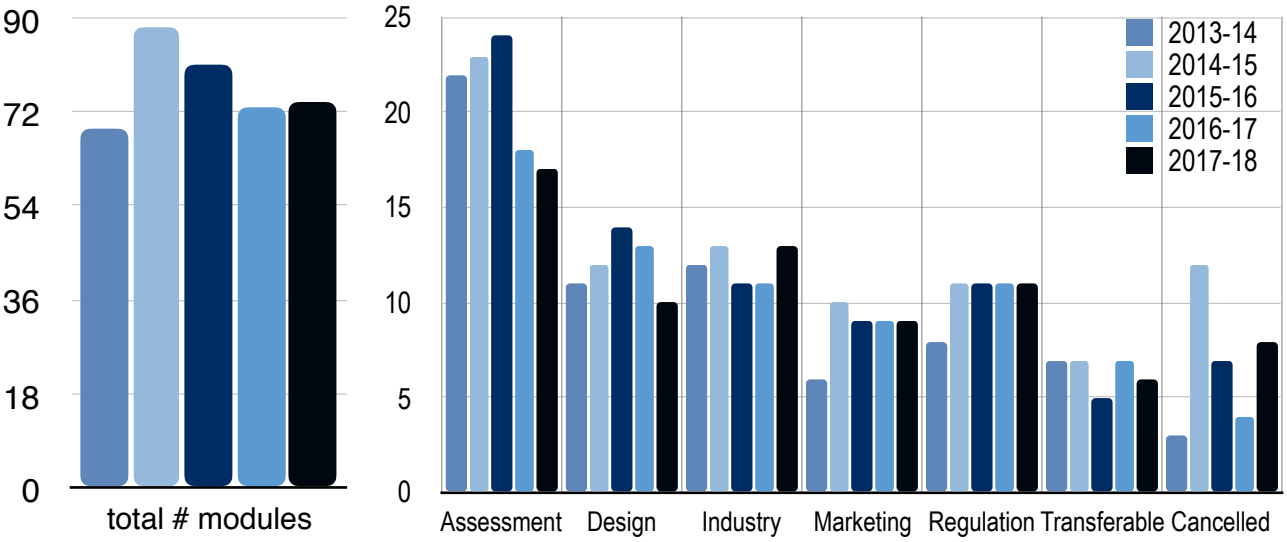
A0109	Transport processes and dispersion of pollutants in the atmosphere
A0112	Bioavailability

D02	Properties of materials and new materials
D10	Soft Materials
D14	Design and Synthesis of Peptides and Peptidomimetics
I0106	Nanoporous Catalysts for Clean Chemistry
T02	Communication skills
T10	Intensive "Survival" Language Course - Catalan

Distribution of Modules by Discipline and by University

The 5th edition witnessed a sharp decrease in the offer of modules in the discipline “Design”, a slight decrease in the offer of modules “Assessment” and an increase in the discipline “Industry”. The remaining disciplines maintain approximately the same offer, in terms of number of modules. The number of cancelled modules reflects the large number of modules on offer compared to the number of students on the course. The consortium offers ca. 70 modules per year, from which 62-66 are effectively chosen by students.

Graphic 7 - Evolution of the number of modules

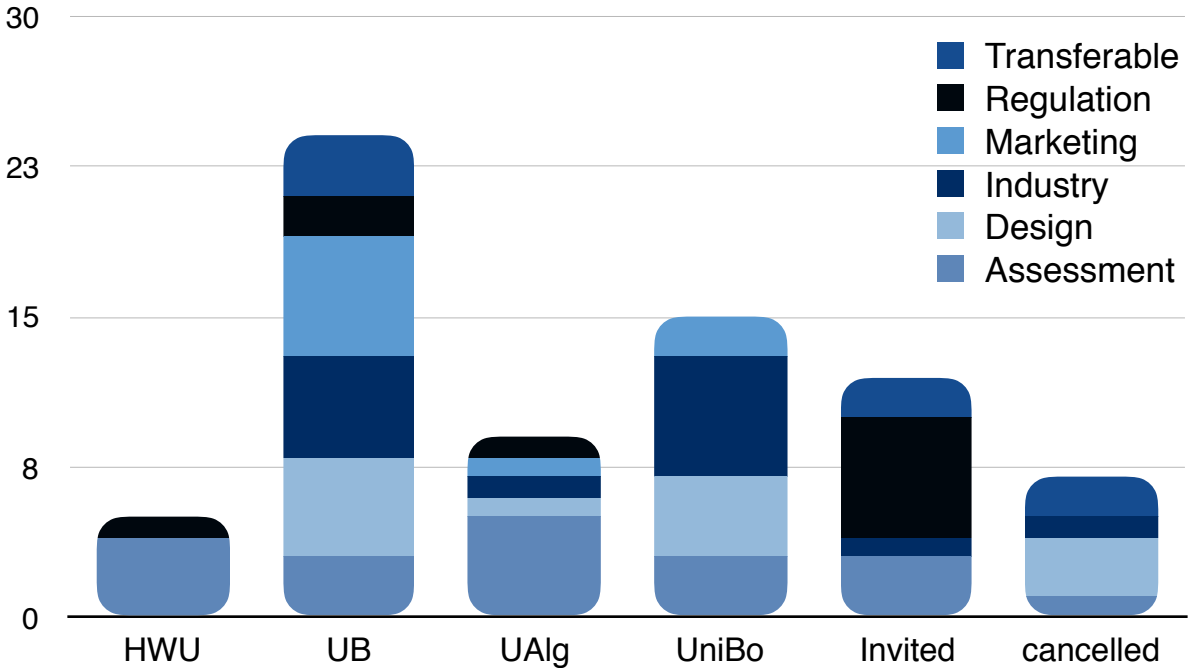


Along the five editions of the course, its composition in terms of number of modules offered in each discipline has stabilised with a large offer of Assessment modules, contributing to 28% of the academic offer of the Consortium, followed by a balanced offer of modules on Design, Industry, Management and Regulation modules, each containing about 11-16% of the academic offer.

Graphic 8 depicts the distribution of module offer among the universities of the consortium. As Host University, UB offers the highest number of modules. Twelve modules were offered

by invited specialists, of which four were offered by Erasmus Mundus Scholars, Prof. Paolo Ricci who has collaborated with the ChIR in all editions, and Prof. Ignacio Leon from the University of La Plata. Six modules were offered by European specialists, including a new transferable skills module "IT Tools for Chemical Registration", offered by Rosa Beaus.

Graphic 8 - ChIR modules 2017/2018 (by university)



Calendar

The calendar for 2017/2018 was defined, like in previous years, taking into account the following principles: 1) fundamental modules are taught before the ones that require knowledge acquired from others; 2) no student takes more than two modules in the same week; 3) considering the time availability of each lecturer.

The calendar for all editions available online at:

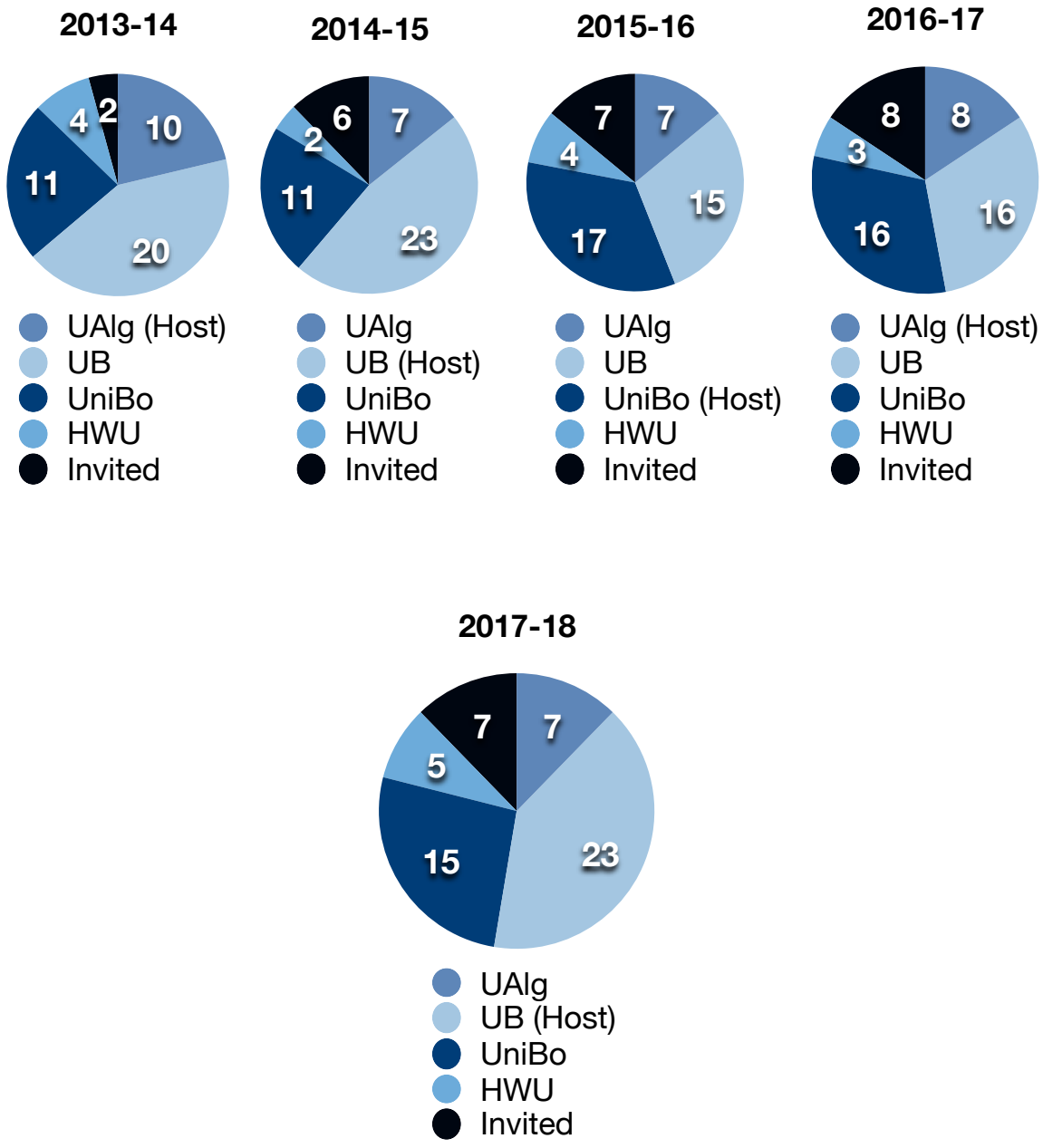
https://calendar.google.com/calendar/embed?src=e8l7govbncv538g5p1sn3l1ksg@group.calendar.google.com&ctz=Europe/Madrid

Teaching Staff Mobility

The high number of staff mobilities is a strong point of the EMMC-ChIR project. Staff mobility opens minds, fosters innovation and creativity in teaching and facilitates research contacts and involvement in transnational projects. The fifth edition of ChIR involved a total 50 lecturers

from the European partner Universities, of which 27 were teaching in the Host university under mobility agreements.

Graphic 9 - Number of lecturers involved



Erasmus Mundus Scholars and Invited lecturers

Two non-European Erasmus Mundus scholar were invited to contribute to the curricular year of the 5th edition:

Paolo Ricci - Adjunct Professor at University of MA (Amherst), School of Public Health; Visiting Professor at Xiamen University (PR China); Professor at University of Bologna (Italy).

Ignacio Leon - Instructor at the University of La Plata (Argentina), in the group of Professor Susana Etcheverry.

The following European experts also contributed to the fourth edition of ChIR:

Cristina Massa - Alba Synchrotton Light Source, Barcelona (Spain)

Eugenia Anta - FEIQUE (Federación Empresarial de la Industria Química Española), Barcelona (Spain)

Kateryna Vengel - Galenicum (Spain)

Rosa Beaus - B&B Asesores (Spain)

Martin Fussi - Team building consultant (Argentina)

Matteo Pori - BASF Pontecchio Marconi (Italy)

Victor Garrido - Alba Synchrotton Light Source, Barcelona (Spain)

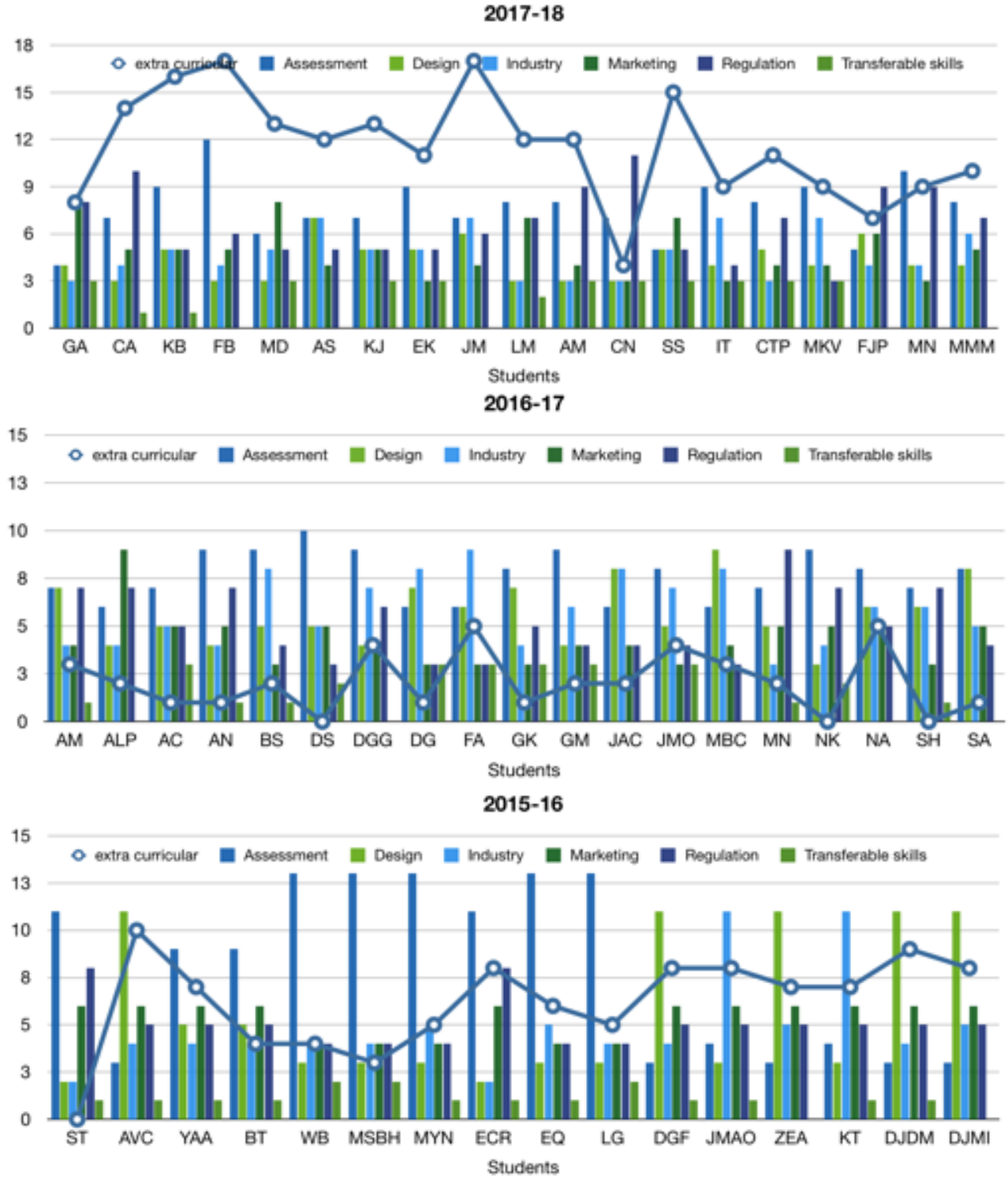
Walter Cabri - Fresenius Kabi Anti-Infectives, Bologna (Italy)

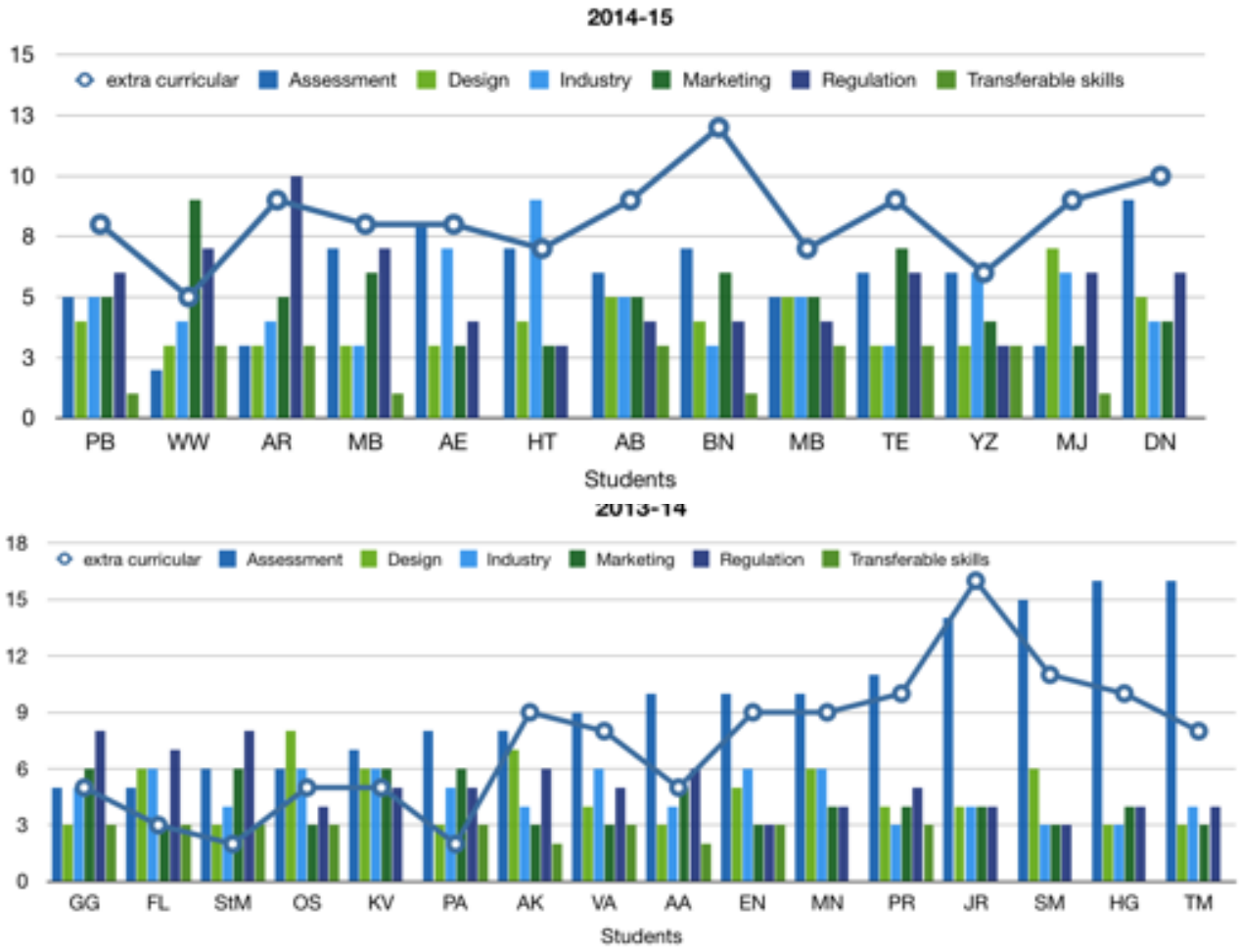
Students' Choices

Study Plans

Compared to the previous editions, in 2017-18 students chose many extra-curricular modules, in some cases corresponding to a workload excess of more than 50%. This may be reflected in the overall student performance. Overall, students' choices are reasonably balanced, with no predominance of one discipline over the other. No student chose more than 11 modules in the same discipline.

Graphic 10 - Students' choice of modules

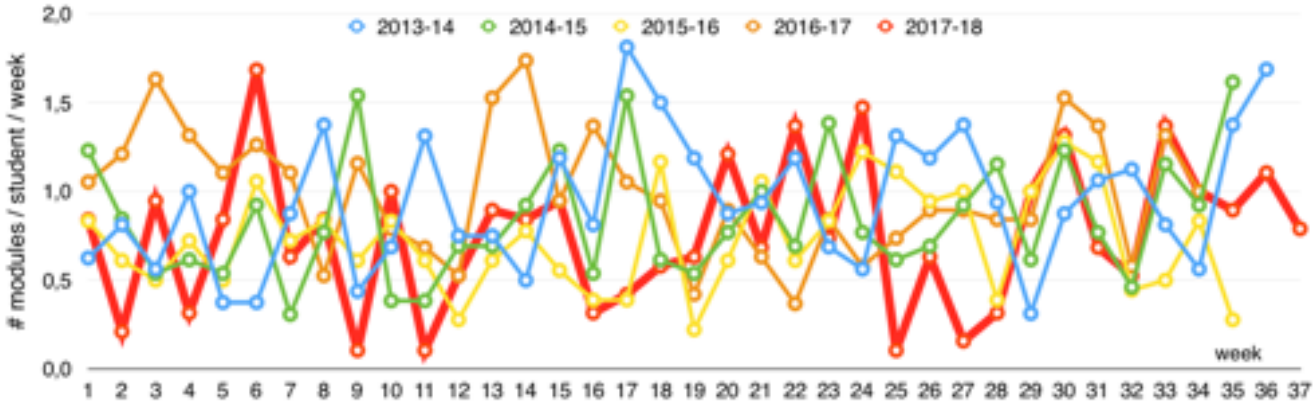




Student Workload

One consequence of the modular and flexible organisation of the course is that there is a risk that students choose modules which result in work overload at some times during the academic year, with other periods of relative low amount of work. Ideally, each student should take one module per week, but a maximum of two modules in one week are allowed, provided there is sufficient time in the following weeks to make up for the added effort. Graphic 11 shows the mean number of modules taken by students per week. In 2017-18 one peak of work was observed on week 6 (early November), but overall the workload was better distributed than in previous years. A few periods of apparent low workload appear on weeks 9, 11 and 25 (December 2017 and April 2018). The fact is that most students took modules in these weeks as extra curricular (for example, T02 on Laboratory Skills), which are not accounted for the student workload.

Graphic 11 - Student workload: average # modules / student / week



5. Research

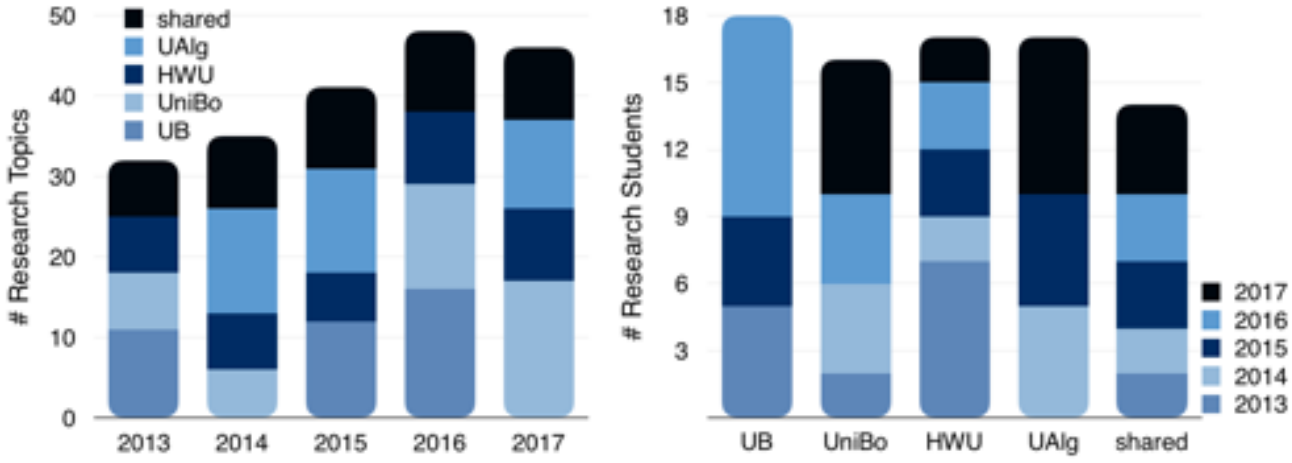
Research Topics

Every year students are offered a large choice of research topics to pursue during the second year of the course. Students are free to choose the research topic of their preference. In case there is more than one student choosing the same topic, they are advised to select a minimum of 5 topics by order of preference. If necessary, students applying for the same topic are selected according to their background and suitability for the topic.

Some research topics are shared in collaboration between two universities of the consortium, and allow the student to spend 6 months in each university. These projects are particularly interesting for further promoting international research collaboration within the topics of the EMMC-ChIR.

Graphic 12 shows the distribution of research theses offered and final distribution of research students in each course edition. The total offer of research topics has consistently increased from 32 in the 1st edition, stabilising in 46-48 in the last two editions. The number of offered shared topics increased from 7 in 2013 to 10 in 2015 and 2016.

Graphic 12 - Offer of research topics and distribution of research students



The distribution of topics among the students of the 5th edition is presented in the next table.

Student Name	Research Host	Supervisor	Topic description
Ahmed Essam Mohamed Shaban	UniBo/CQE	F. Grepioni/ M.T. Duarte	Co-crystals of active pharmaceutical ingredients: a new frontier of intellectual property strategy.
Alemu Bejiga Melka	UAlg	Maria Clara Costa (UAlg)/Helena Ferreira (AGRIPRO AMBIENTE)	Acid mine drainage treatment: Development of a biologic passive system.
Chau Nguyen	UAlg/UB/ UniBo/HWU/ APEQ	Isabel Cavaco/ Susana Gomes	Search for alternatives for SVHC used in Portuguese Chemical Industries.
Chen Tun-Pu	HWU	Thomas Aspray/ Teresa Fernandes	Environmental microbial safety assessment of nanomaterials.
Christine Abey Ashaolu	UAlg/UB	Isabel Cavaco / Daniel Sainz	Developing national working technical chemical regulations for national agency for food and drug administration and control (NAFDAc) of Nigeria with comparative analysis of the european chemical (REACH) regulations.
Eyob Mulugeta Kebede	UAlg	Ana Costa/ Margarida Ribau Teixeira	Exploring agricultural waste as raw material for the production of bioflocculants.
Francesco Bignami	UniBo	Emilio Tagliavini / Luca Lucentini (SSP)	Risk analysis applied to wastewater reuse – First application based on SSP in Italy.
Francisco Javier Vega Piedras	UAlg/ Universidade de Lisboa	Maria Clara Costa (UAlg), Ana Paula Paiva (FCUL)	Recovery of metals from acid mine drainage: comparison of chemical and biologic strategies.
Gulsah Angi	UAlg/UB	Isabel Cavaco / Daniel Sainz	Study on the different strategies and approaches followed by European companies to comply with REACH regulations.
Israel Alemayehu Tekamo	UAlg/CQE	Isabel Cavaco (UAlg) / Isabel Correia (CQE)	Design, synthesis and characterization of new metallodrugs.

Student Name	Research Host	Supervisor	Topic description
Jacopo Monaldi	UniBo	P.G. Cozzi	Catalytic stereoselective redox reactions mediated by photocatalysis or air.
Kateryna Babych	UAlg / Universitat de La Plata	Vera Ribeiro Marques/Ignacio Léon	Deciphering the effects of metal-based drugs on cell signalling pathways in cancer cells.
Kiran Abraham Jacob	UniBo/IISB	Claudia Tomasini	Underwater adhesion promoted by sea silk pseudopeptides.
Lorenzo Marotti	UniBo	Fabrizio Passarini	Study on the application of Circular Economy in European Countries
Maciej Doruch	UniBo	Fabrizio Passarini	Promoting Circular Economy in Italian Chemical Industry
Maria Katrina Vasquez-De Paz	UniBo	Paola Galletti/Chiara Samorì	Use of renewable sources of materials for producing valuable chemicals.
Michelle Myla Lucas Marquez	HWU	Karl Stephen	Oil recovery efficiencies.
Mulata Haile Nega	UAlg	Vera Ribeiro Marques	Genetic determinants of response to chemicals.
Suthapat Sathityatiwat	UAlg/ Universidade de Lisboa	Maria Clara Costa (UAlg), Ana Paula Paiva (FCUL)	Recovery of metals from acid mine drainage: comparison of chemical and biologic strategies.

ChIR Symposia

The ChIR Consortium started in 2015 a cycle of annual Symposia dedicated to topics on chemical safety regulation and innovation. Each Symposium is hosted by the annual Host University, and brings together professionals, researchers and students from all over the world to discuss state of the art issues on chemical safety, sustainability and the regulations created to assure them. It is an opportunity for students to present and discuss their research work, and for professionals to contact with the latest research advances, to meet the future professionals in the field and to exchange ideas and solutions regarding common issues.

4th ChIR Symposium, 2018

UB hosted the 1st ChIR Symposium in 2015, and the 4th Symposium in 2018. This year's Symposium took place in June 8-9. The programme and details are available online at http://emmcchir.org/symposium2018/. Research students from UB, UniBo and HWU presented their work orally and in the form of posters. Students of the 5th edition participated in the organization. Invited keynote speakers included Carles Estevez (InKemia IUCT, Spain), Rosa Prati (Caviro SCA, Italy), David Panyella (Puig S.A, Spain), Stefania Iandoli (Fresenius Kabi, Italy), Laura Tomasoni (Eley, S.r.l., Italy) and Isabel Cavaco (UAlg, Portugal).

6. Quality Assessment

Student Performance

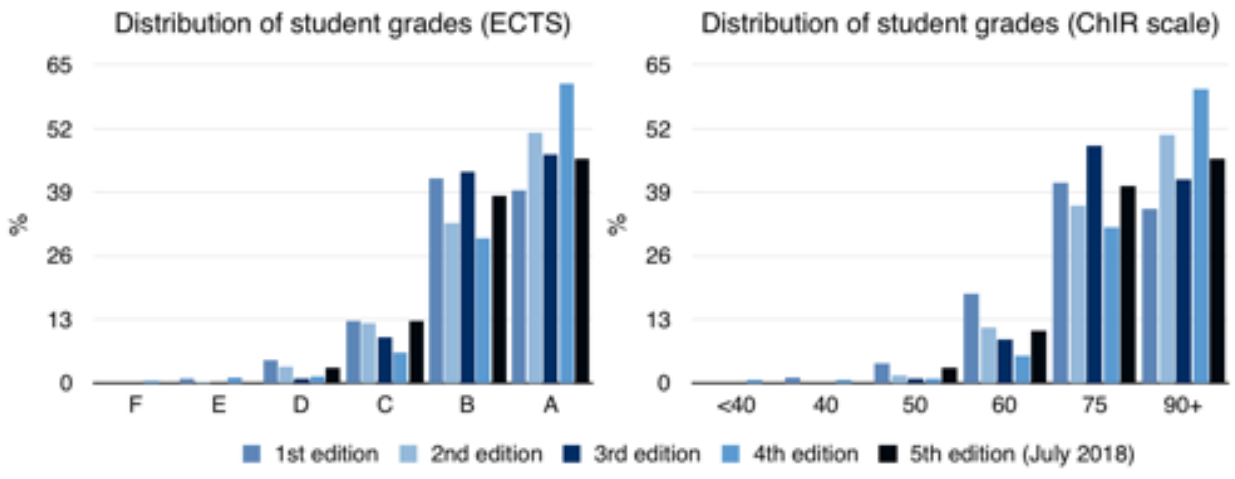
In order to facilitate the transfer of grades between universities of the consortium, two different scales are used: the ChIR “absolute” grading scale (0-100), and the ECTS grading scale (A-F).

By the end of July 2018, 33 modules were graded from the total of 60 modules subject to grading (Transferable Skills modules are not subject to grading). Considering that one month is allowed between the module classes and submitting the assignments, and that lecturers are allowed two months to provide the evaluation results, the grade of the 20 modules taught after April 2018 are not expected to be ready. Nevertheless, 10 modules taught before this date do not yet have recorded grades. This corresponds to a delay in 30% of the 33 modules for which students had already submitted assignments and two months had passed for the evaluation. This situation is similar to what was observed in the first two editions, but worse than the 3rd and 4th editions, when only 5% and 15% of the taught modules suffered from delays in grading.

The average grade in the fifth edition is 85%, considering all the data collected by July 2018, and 46% of all grades are A. These results are similar to previous editions, and reflect the high quality of Erasmus Mundus students. The slightly lower results compared to the 3rd (86%) and 4th (88%) editions might be explained by some dispersion of students taking too many extra curricular modules.

Graphic 13 compares the student grades in individual modules during the four editions. Results for the fifth edition are not complete, as not all grades are yet available.

Graphic 13 - Distribution of student grades



Student initiatives

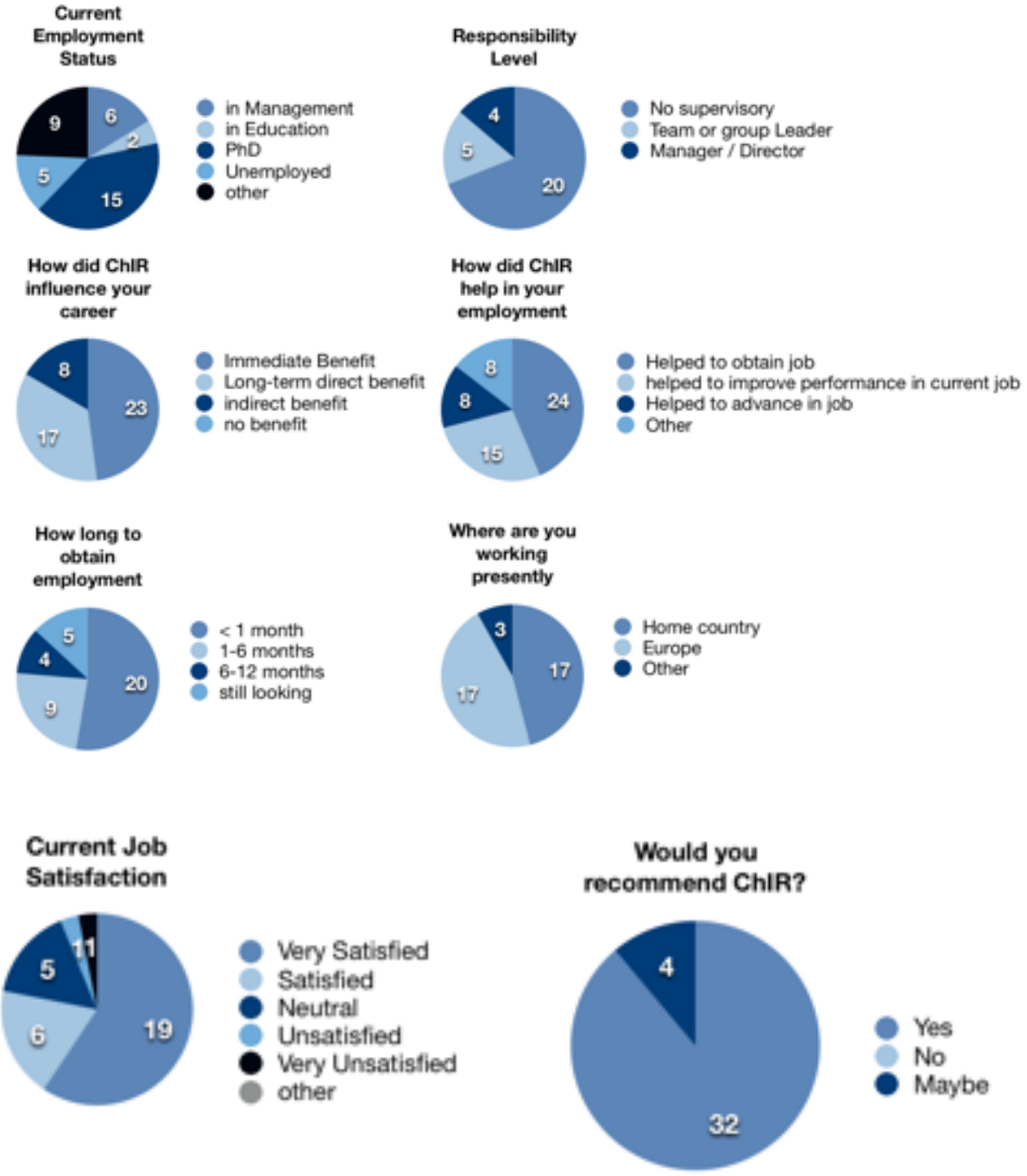
For each edition of ChIR, two representatives are elected among ChIR students to participate in the Programme Committee. A student representative for the EMA (Erasmus Mundus Alumni Association) is selected in a separate election. No EMA election took place during the 2nd edition of ChIR.

Elected student representatives:

	PCm	EMA
1st edition	Victor Ajao (Nigeria) Sohaib Mahri (Algeria)	Victor Ajao (Nigeria)
2nd edition	Paola Blair Velazquez (Costa Rica) Chukwuka Bethel Anucha (Nigeria)	-
3rd edition	DJ Donn Matienzo (Philippines) Diana Guillen Ferrari (Paraguay)	Pauline Roxas (Philippines)
4th edition	Jose Albert Cruz (Philippines) Danilo Bertagna Silva (Brazil)	Maybel Nonato (Philippines)
5th edition	Francesco Bignami (Italy) Maria Katrina Vasquez (Philippines)	Sharmaine Atencio (Philippines)

Alumni Information

The statistics below reflect the population of ChIR graduates, 9 months after graduation. Thirty-seven graduates filled the survey, consisting of 84% of the ChIR graduates from the first three editions. Fourteen (88%) of the sixteen graduates of the 1st edition, ten (77%) of the thirteen graduates of the second edition and thirteen (87%) of the fifteen graduates of the 3rd edition filled the survey.



Comments from EMMC-ChIR alumni 2015-2017
Well designed program and best experience i have ever had.
Good Program, but some modules and professors need to be seriously revised.
EMMC-ChIR was an excellent program to know how the state of the art in the EU and gave me the tools and knowledge to continue my career as a PhD.

Internal Quality Assessment

As part of the ChIR internal quality assessment, students were invited to assess the course at three levels: the individual modules, the Host institution and the project as a whole.

The **Host institution and the project as a whole** were assessed through one annual questionnaire distributed in 2018. The results are summarised below in this text.

Individual modules were assessed through online questionnaire available at the end of each module in the Moodle portal. The questionnaire and results of the assessment of individual modules can be found in annex 2.

Questionnaires were managed using the Moodle portal as well as Google forms.

QA data is analysed in the PCm meeting. The follow-up from issues raised in 2017 may be found in Annex 1.

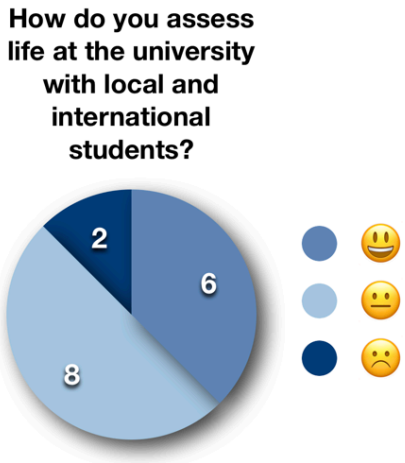
General Questionnaire

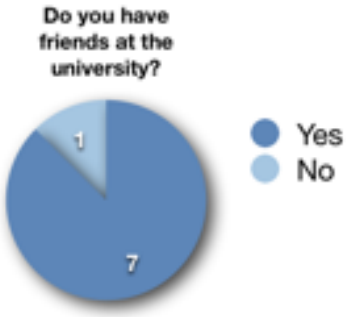
The following results come from the ChIR annual questionnaire, distributed to students of the 5th edition completing the curricular year in UB. The first part of the survey was distributed early in the academic year and covers the motivations of students coming to ChIR. It was filled by 10 students (53%). The second part of the survey was distributed close to the end of the academic year and evaluates the course as a whole and the conditions of the Host University. Nine (47%) students participated.

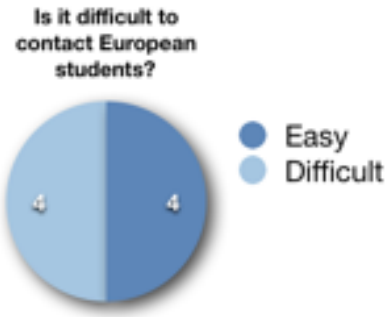
Answering all questions was not mandatory, so several questions were left blank. The results are summarised below.


How did you learn about Erasmus Mundus and ChIR?
3
7
Internet
Advertisement
Professor
Friend
Other

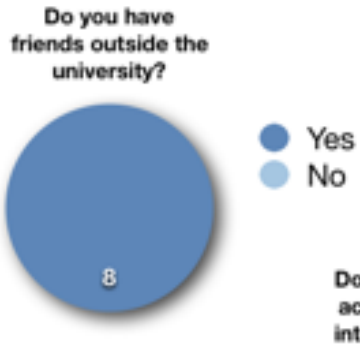

How important are the following aspects in choosing an EM master course?
Your master course study program
Carrer opportunities
scholarship
Academic quality of the Master course
Academic quality in the EU country
Renown of the profesosrs / institution
International character of the programme
culture of countries in the consortium
Others
Opportunity to learn local language
Recommendations
Information on the internet
Weather/location
Previous experience in living/studying/working in Europe
0
1
2
3
4

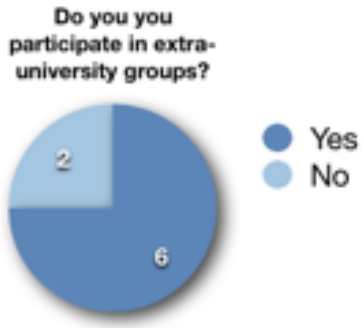

How do you assess life at the university with local and international students?
2
6
8

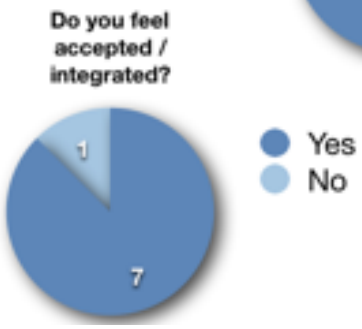

Do you have friends at the university?
1
7
Yes
No


Is it difficult to contact European students?
4
4
Easy
Difficult


Do you participate in university groups?
8
Yes
No


Do you have friends outside the university?
8
Yes
No


Do you you participate in extra-university groups?
2
6
Yes
No


Do you feel accepted / integrated?
1
7
Yes
No

Pedagogic Quality of Lectures

Academic Quality of Lectures

Composition and Content of the Curriculum

Balance between lectures an self-initiated study

Balance between lectures, group work and other forms of study

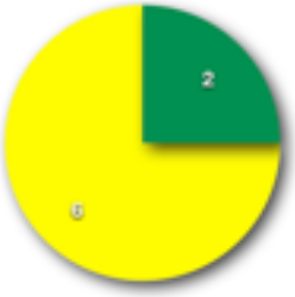
Help, access to and time devoted to you by the academic staff

Service from the administrative staff

Service from the international office

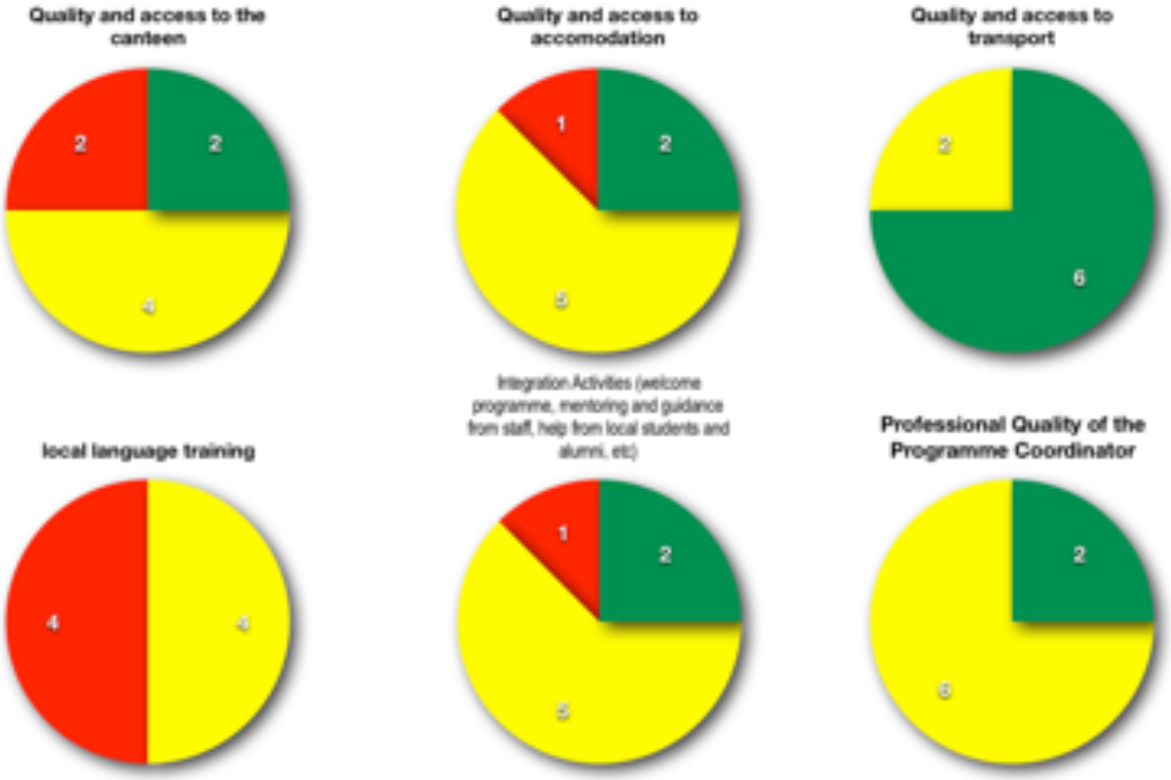
Quality and access to the library

Quality and access to the laboratories



Quality and access to the computing facilities

Quality and access to the internet



Specify below any aspect of your course you wish to add:
1. Some similar modules could be combined or reorganised. 2. The information about the difficulty of each module should be included in the module description, even though the students coming from different fields, there should be some approaches for gathering the data.
Culminating activity and/or recognition ceremonies for students and professors during the ChIR symposium
- The courses are too short to learn in deep. - English level of some Instructors was very bad and sometimes their interaction with the class was also very bad. - English level of some students was very bad and sometimes their interaction with the class was also bad. - 1 person to coordinate everything definitely not enough. 22 people and many different issues to handle, easy to understand why Prof. Daniel was struggling. So there must be other people to help the coordinator.
It would be better, there is an opportunity for an Internship integrated with the course.
More courses about regulation or practical application of regulation
Nothing.

The best in the EMMC-ChIR	The worst in the EMMC-ChIR
Diversity and exposure to life in Europe and to international students. The quality of a few of the academics and professors is quite high and the universities involved are well known.	A lot of the courses offered are very similar and talk about the same topics and so seem redundant. I think this is because of the structure of the Master which seems to scratch the surface of so many topics without delving into any deeply. I understand the reasoning, but I think the end I feel like I haven't learned that much that I can use professionally, only gained a lot of general knowledge about many fields.
For me everything is fine and best.	Nothing.
I liked that I got into the ChIR edition that is hosted in Barcelona. This is my first time to be in Europe and to be away from my home country for a long time. Adjusting is not that difficult as I thought it would be because the weather is not dramatically cold, there is a strong presence of Filipino community here, and the culture is not that far from my home country. I also find the facilities of the host university, UB, to be beyond my expectations. I like how well-equipped our classrooms are, and I enjoyed using the library and common spaces for studying and hanging-out. Another best thing that I appreciate about ChIR is the variety of the courses and how they are set up into modules. We have the freedom to choose and take the modules according to our interest and background.	The not-so-good parts of ChIR is mostly about the delays that we students of 5th edition have collectively experienced: First, the delay in studentship. While we were informed that the studentship will be given a month after the start of classes, ours took a bit longer. I appreciate though that our experience have improved compared to that of the 2nd edition students who also started in UB, but then I hope there will be a mechanism that will prevent this in the future.
We have bit knowledge of everything.	I was not able to learn the language of the country but mainly because I came here late. but I think 2 weeks of language lesson is still not enough
Variety of modules.	Some professors and management personnel are hard to reach.

The best in the EMMC-ChIR	The worst in the EMMC-ChIR
- Living in Barcelona! - To meet many people, instructors from different backgrounds, cultures, and countries!	- Delayed payments of salaries at the beginning was a big problem. Especially, we had to pay an extra deposit or agency fees at the beginning of the year and it was the worst time since we did not have enough money. - Secondly, and definitely the İnsurance Company you have selected. HORRIBLE!!!! - And we had a difficult time until we solved our Master thesis topic selection. Everyone must have a right to choose a topic they would like to work! This is our future and no one should spend a year on a topic that they do not want to work on! - It is ridiculous that we are not able to get our grades on time!! WHY? This was the biggest disappointment I had regarding to the programme and after a while, I have lost my passion for a better assignment. I did my minimum because I felt no one respects our works!
1. We can meet different people and get to know their cultures, which is very interesting. 2. Many professors from industry share useful information and their experiences with us, which are very inspiring and made us dream about our future. 3. We could get a lot of knowledge not only from the lectures but also through self-learning. 4. Barcelona is a very nice place to live, we could enjoy different things and visit any place we like in an easy way.	1. Some assignments are far more difficult than the lecture we have in the classes. 2. Too many modules in the same period of time, which create a lot of assignments, we don't have enough time and energy to finish them in a good quality. 3. We couldn't get the reply from professors immediately or in a reasonable time.

Module Questionnaires

The questionnaires designed to collect the opinion of students on the quality of the modules were based on the SEEQ (Students' Evaluation of Educational Quality) reference questionnaire developed by H. W. Marsh[2].

The detailed results from the module questionnaires collected by July 2018 can be found in annex 2.

An individual report for each module summarises the quantitative as well as qualitative analysis of the questionnaires. Results from both students and lecturer are represented in the same page by coloured pie charts and can be easily analysed. An overall “green” report does not raise concerns, while the appearance of “reds” requires some attention. A complete version of the report, containing the open student comments, is given to the lecturer and can be used to improve the module in future editions.

2 “SEEQ: a reliable, valid and useful instrument for collecting student’s evaluation of university teaching”, H. W. Marsh, British Jpurnal of Educational Psychology, 52 (1) 77-95, 1982

Annexes

Annex 1

Follow-up on issues raised in the 5th PCm meeting

Annex 2

2a - Results of the QA of individual modules - 4th edition

2b - Results of the QA of individual modules - 5th edition

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