



POLITECNICO
MILANO 1863

Chemical Engineering

Open Day 2025

SCHOOL of INDUSTRIAL and INFORMATION ENGINEERING

Matteo Pelucchi – Marco Derudi

<http://www.ccs-chimica.polimi.it/>



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Chemical Engineering: *Context and Challenges*

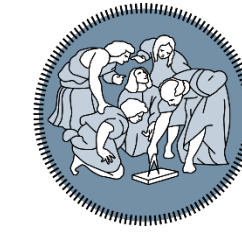
Sustainable Development Goals



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SDG and Chemical Engineering



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SDG and Chemical Engineering



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- **Fertilizers**
- **Food & Beverage:** sustainable products and processes
- **Packaging** and packaging **recycle**



- **Water treatment** technologies
- **Desalting** of ocean water
- Optimization of **water consumption** in production processes



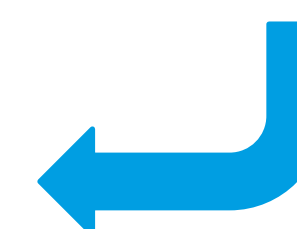
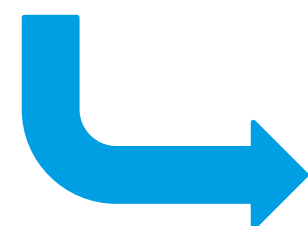
- **Hydrogen** production and use
- **Batteries** and fuel cells
- **Sustainable fuels** production (E-fuels, bio-fuels, ammonia)
- **Wastes conversion, biogas** production



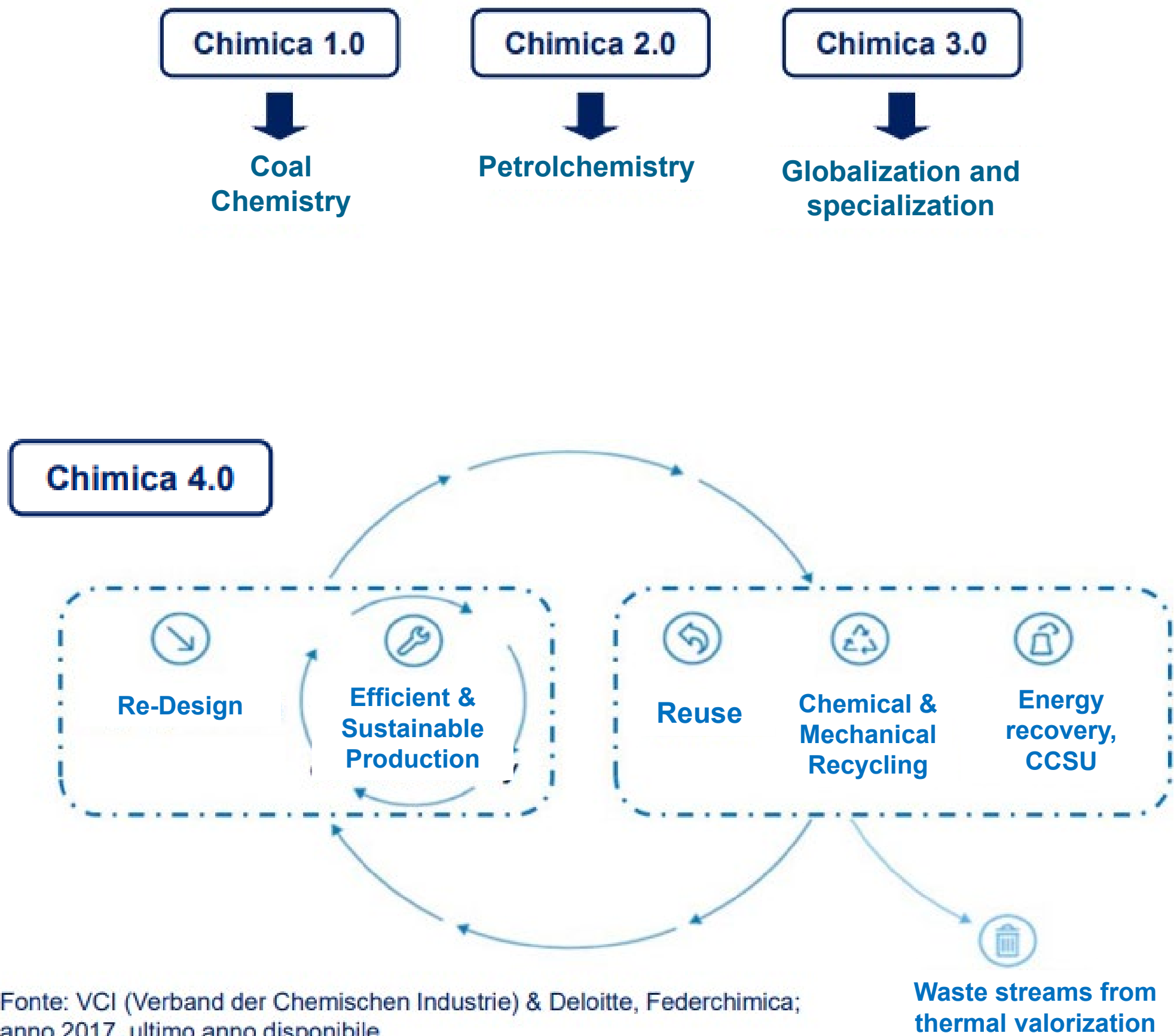
- **Waste materials recycle** (plastics)
- **Bio-polymers** and bio-plastics production
- **Optimization** of processes (to include recycling capabilities)
- **Vaccines** and drugs availability
- **Process intensification** and flow chemistry
- **Process adaptation** and flexibility
- **Job creation** from new markets



- **Pollutants reduction** and **abatement**
- Carbon capture sequestration, utilization and storage (**CCSU**)
- Design and optimization of **cleaner processes**



Chemical industry: the big picture



Fonte: VCI (Verband der Chemischen Industrie) & Deloitte, Federchimica; anno 2017, ultimo anno disponibile



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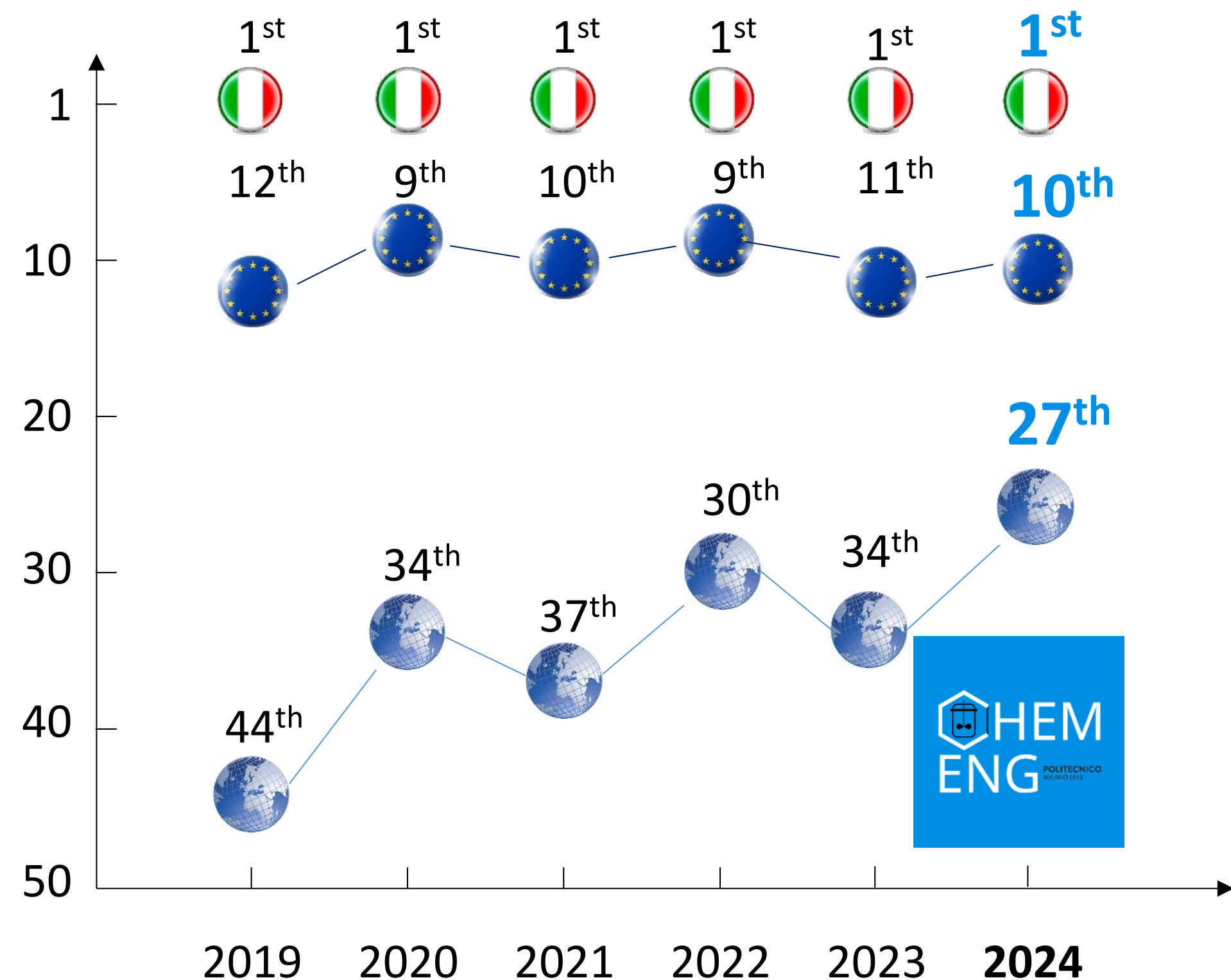
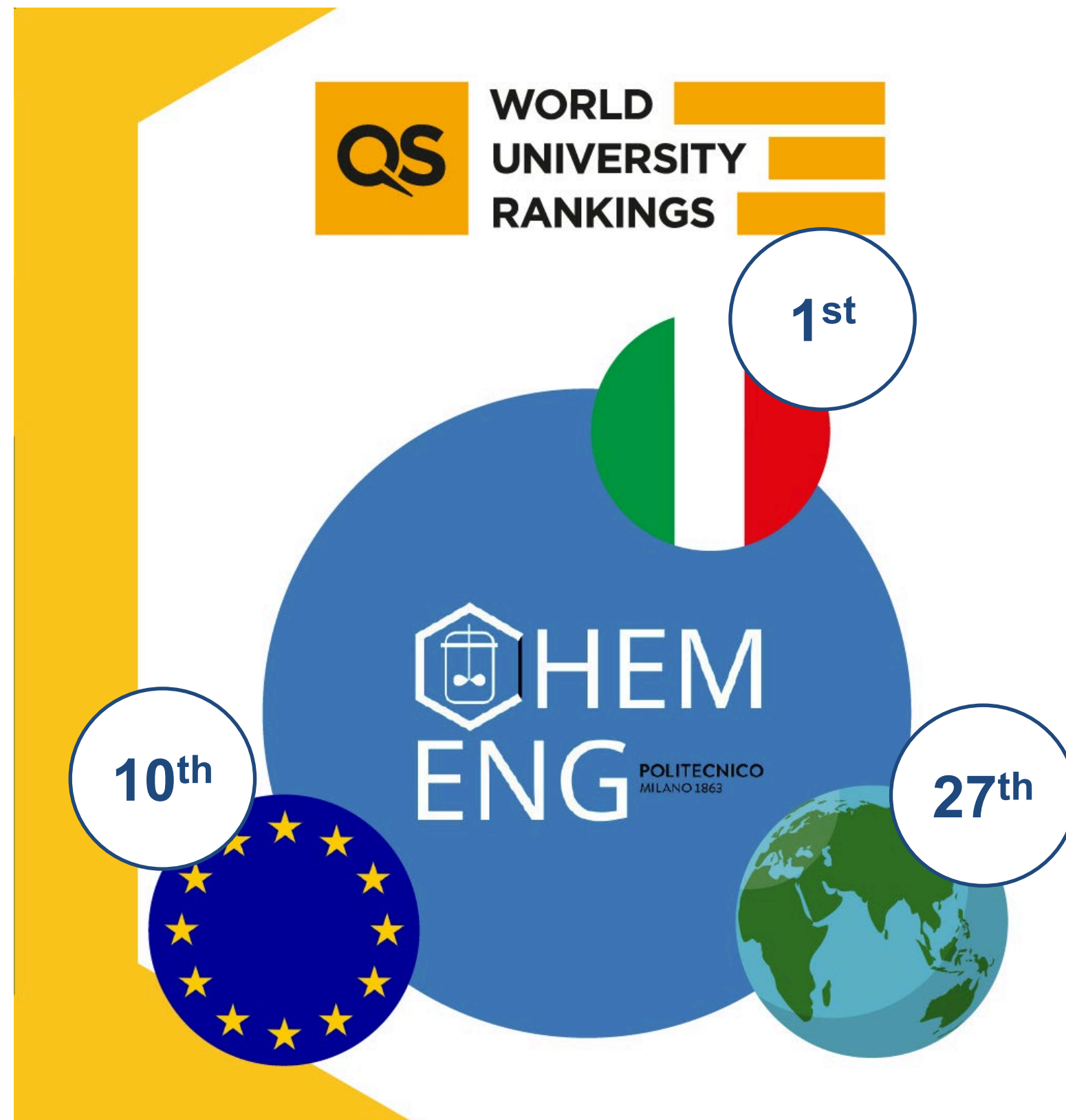
Chemical Engineering @POLIMI *Some numbers*

International Rankings



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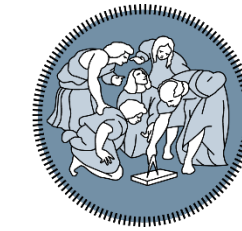
PoliMi, an Italian, European and World leading university



*12th in Engineering – Petroleum Worldwide

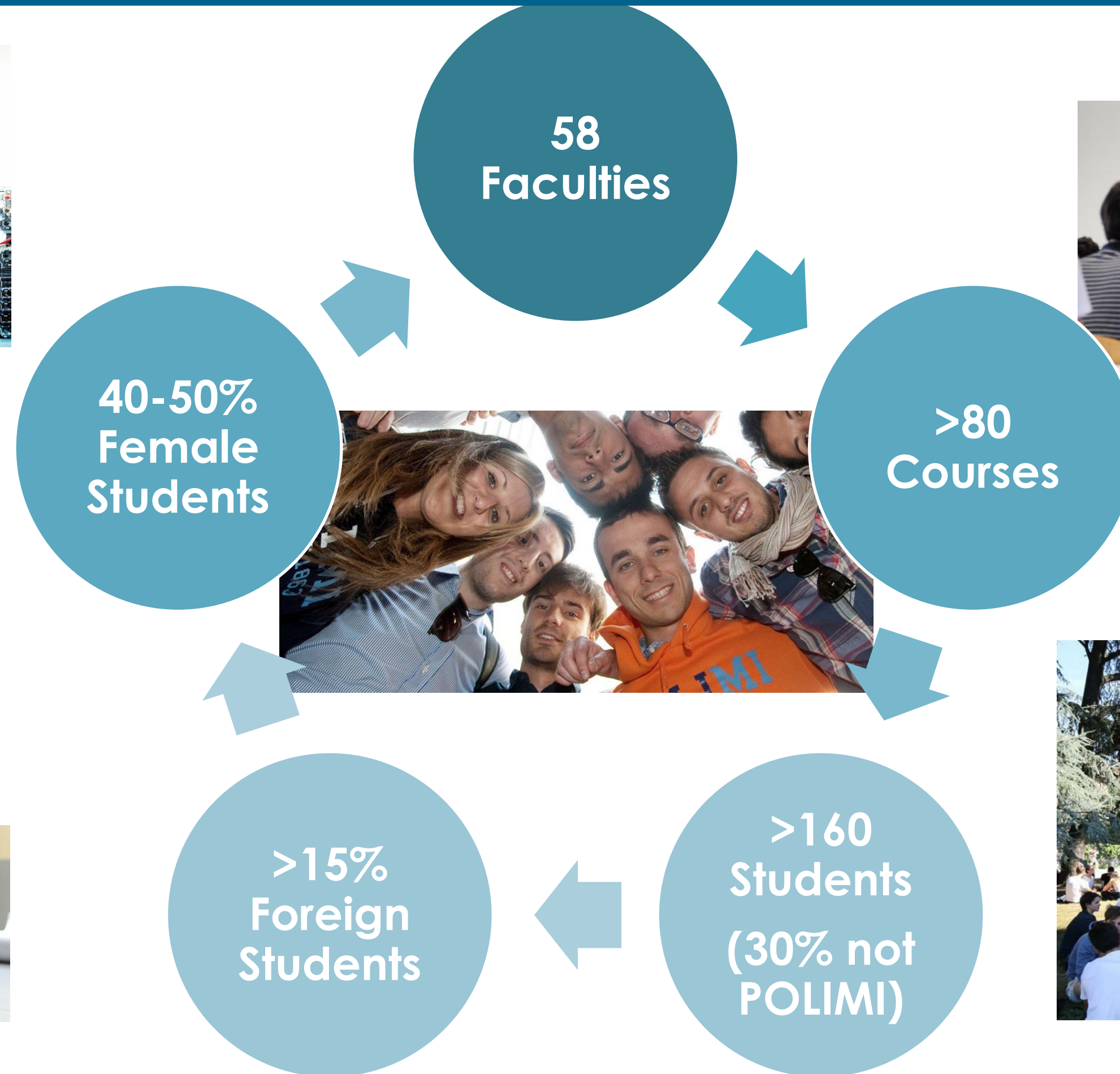


Master Degree in Chemical Engineering

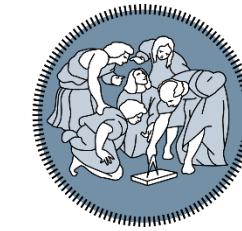


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<https://www.ccs-chimica.polimi.it/>



What do students say about us?



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Graduated students in Chemical Engineering

- ~**94%** is completely satisfied by the education career
- **97%** «Degree fits work» rating (among the highest at PoliMi)
- ~**90%** would chose PoliMi again



On average, our graduates are more satisfied about their education compared to other PoliMi students!

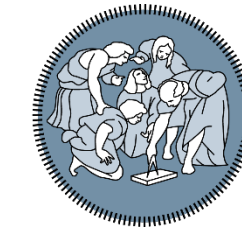




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Chemical Engineering @POLIMI *Job Opportunities and Employability*

Job opportunities



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Chemical Industry

Pharmaceutical Industry

Energy and Renewables Industry

Materials industry

Transport Industry

Safety

Research

Petrochemical Industry

Oil&Gas Industry

Cosmetics Industry

Textile Industry

Food&Beverage Industry

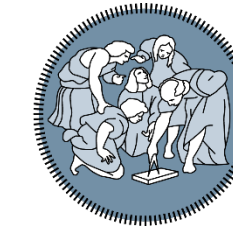
Metals Industry

Environment

Chemical engineering is process engineering: you learn methodologies of **chemico-physical transformation of matter**, aimed at the production of material goods, supply of services, risk prevention, reduction of environmental impact,



Employment Statistics (2024)



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CHEMICAL ENGINEERING

Nel 2022 hanno conseguito la laurea magistrale in Chemical Engineering 122 studenti di cui 109 italiani e 13 internazionali. Hanno risposto all'indagine in 101.

TASSO DI OCCUPAZIONE*



99%

* calcolato su occupati, disoccupati,
in cerca di una nuova occupazione

OCCUPATI ENTRO 6 MESI*



95%

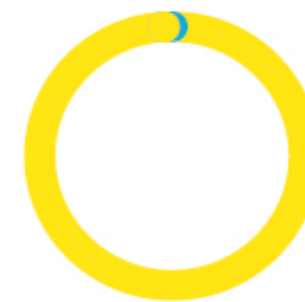
* percentuale su chi è occupato a 1 anno dalla Laurea

GUADAGNO MENSILE NETTO



€2.073

RAPPORTO DI LAVORO



- 99% Dipendenti
- 1% Autonomi

TIPOLOGIA DI CONTRATTO



- 71% T. Indeterminato
- 3% T. Determinato
- 5% Apprendistato
- 1% Stage
- 20% Altro*

* Inserimento/a progetto/collaborazione

DIMENSIONE AZIENDA



- 48% 1-250
- 19% 251-1000
- 33% +1000

DOVE LAVORANO

10% Italiani che lavorano all'estero

- Internazionali che lavorano in Italia

PRIMI 3 SETTORI

20% Oil & Gas
14% Meccanica e Impiantistica
13% Chimica

TOP 4 AREE DI COMPETENZA

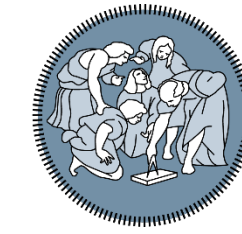
68% Progettazione
18% Ricerca e Sviluppo
18% Pianificazione
18% Qualità e Controllo




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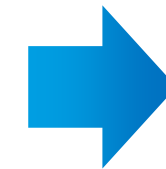
ChemEng@Polimi


Programme structure

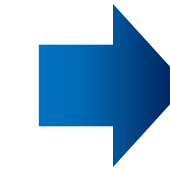


Others


Laurea –
Bachelor of Science
Ingegneria Chimica
(3 years, 180 CFU)




Laurea Magistrale –
Master of Science
Chemical Engineering
(2 years, 120 CFU)




Dottorato di Ricerca –
Doctor of Philosophy (PhD)
*Industrial Chemistry and
Chemical Engineering*
(3 years)

- In English since 2014

- **NEW topical tracks!!!!!!**

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Context and Motivations

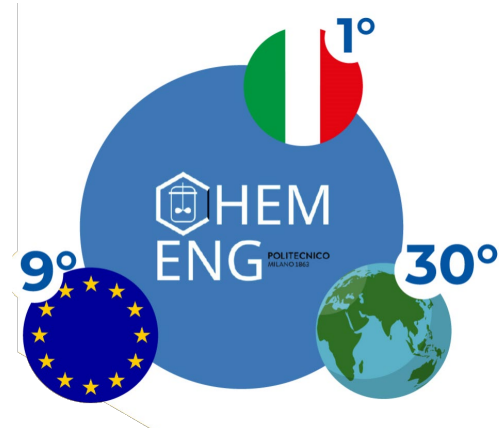
Master of Science in Chemical Engineering



Sustainability Goals:
New challenges
Ambitious objectives



Market Needs:
New technologies
New competencies



A top-ranked University:
Excellence
Leadership
Internationalization

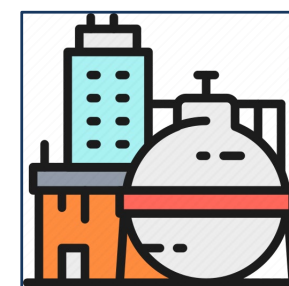
1st Year (60 CFU)

Chemical and Catalytic Reaction Engineering
Advanced Transport Phenomena
Applied Physical Chemistry
Chemical Plants and Process Operations Management
Process Systems Engineering A+B
Processes of the Organic Chemical Industry

2nd Year (40 CFU)

Tracks: 25 CFU mandatory + 15 CFU eligible

+ Master Thesis Project (20 CFU)



Process Design

Advanced knowledge and technical tools to operate in the various areas of process engineering (e.g. design equipment, control)



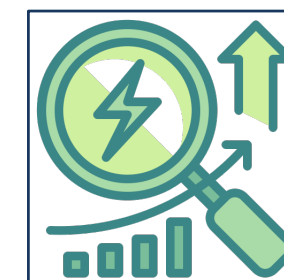
Environment & Energy

advanced knowledge and tools on chemical engineering applications for technologies for environmental protection, for the energy sector and for energy transition



Biochemical & Pharma

Advanced knowledge and technical tools to operate in the pharmaceutical and biotechnology industry

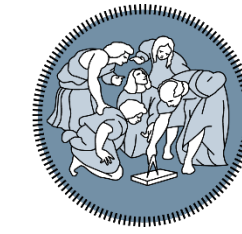


Research & Development

Advanced knowledge related to fundamental subjects of chemical engineering for research, technological development, and innovation

New courses and topics + Laboratory Activities + Innovative Teaching

ChemEng @ PoliMi: structure

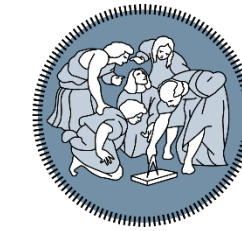


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1st Year, 60 CFU

Course (mandatory)		CFU
I Sem	Chemical Plants and Process Operations Management	10
	Advanced Transport Phenomena	10
	Applied Physical Chemistry	10
II Sem	Chemical and Catalytic Reaction Engineering	10
	Process Systems Engineering A	5 +
	Process Systems Engineering B	5
	Processes of the Organic Chemical Industry	10
		60

Environment and Energy



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Learning objectives:

- To provide the knowledge and tools related to the key role of chemical engineering in the context of environmental protection and energy production technologies
- The knowledge must cover both standard technologies (e.g. oil and gas industry) and those related to the energy transition (green chemistry, sustainability, etc.)

Mandatory courses (25 CFU)

Scientific Sector (SSD)		
• 5 CFU.	Catalysis for Energy & Environment	- ING-IND/27
• 5 CFU.	Thermochem. Proc. for Carbon Neutral En. Transfor.	- ING-IND/25
• 5 CFU.	Electrochem. Tech. for Energy Production and Storage	- ING-IND/23
• 5 CFU.	Environmental Impacts	- ING-IND/23
• 5 CFU.	Life Cycle Assessment of Materials and Processes	- ING-IND/22
		I Sem
		II Sem

2nd Year, 25 CFU mandatory + 15 CFU eligible + 20 CFU Thesis

Learning Objectives:

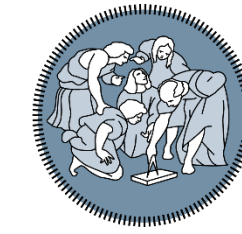
- To provide the knowledge and tools required by the many and different areas of chemical processes engineering
- The knowledge included the design of facilities and equipments, of chemical plants, their simulation, control and operation, together with economic and management aspects.

Mandatory Courses (25 CFU)

Scientific Sector		
• 5 CFU.	Sust. process design for nat. gas and energy carriers	- ING-IND/25
• 5 CFU.	Proc. Control & Instrum. Lab.	- ING-IND/27
• 5 CFU.	Process Design: Principles and Methods	- ING-IND/25
• 5 CFU.	Dynamics and Control of Chem. Processes	- ING-IND/26
• 5 CFU.	Mechanical Systems Dynamics	- ING-IND/13
I Sem		
II Sem		

2nd Year, 25 CFU mandatory + 15 CFU eligible + 20 CFU Thesis

Biochemical and Pharma



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Learning objectives

- To provide the knowledge and tools required by the many areas related to biotechnologies, health and care and in particular of the pharmaceutical and biotechnology industry
- The knowledge includes: processes and equipments of the pharmaceutical industry, DS/DP and packaging, regulatory aspects, process development and technology transfer

Mandatory Courses (25 CFU)

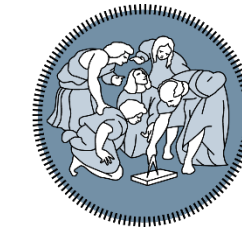
		Scientific Sector
5 CFU.	Flow Chemistry	- ING-IND/25
5 CFU.	Formulation Engineering	- ING-IND/23
5 CFU.	Manufacturing of Biopharmaceuticals	- ING-IND/23
5 CFU.	Pharmaceutical Chemistry Technology	- CHIM/07
5 CFU.	Nanomedicine and Pharmaceutical Innovation	- ING-IND/23

I Sem

II Sem

2nd Year, 25 CFU mandatory + 15 CFU eligible + 20 CFU Thesis

R&D for industrial applications



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Learning Objectives:

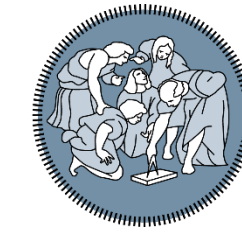
- To provide the advanced knowledge of chemical engineering fundamental aspects required by industrial research practices
- The knowledge covers both methodological approaches and specific contents related to chemical kinetics, catalysis, mathematics, chemistry and advanced separation processes

Mandatory Courses (25 CFU)

		Scientific Sector	
• 5 CFU.	Advanced Mathematical analysis	- MAT/05	I Sem
• 5 CFU.	Methods for Catal. Kinetic Investigation	- ING-IND/27	
• 5 CFU.	Chemical Kinetics and Dynamics: Theory and App.	- ING-IND/24	
• 5 CFU.	Adsorption and Membrane Separations	- ING-IND/23	
• 5 CFU.	Applied Chemistry for Technologies	- CHIM/07	II Sem

2nd Year, 25 CFU mandatory + 15 CFU eligible + 20 CFU Thesis

International Mobility



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Course (Mandatory)	CFU
Chemical and Catalytic Reaction Engineering A	5
Advanced Transport Phenomena A	5
Applied Physical Chemistry A	5
Chemical Plants and Process Operations Management	5
Processes of the Organic Chemical Industry A	5

Course (Mandatory)	CFU
Chemical and Catalytic Reaction Engineering B	5
Advanced Transport Phenomena B	5
Applied Physical Chemistry B	5
Chemical Plants and Process Operations Management	5
Processes of the Organic Chemical Industry B	5

For students participating to **international mobility programs** the mandatory courses (10 CFU) can be substituted by corresponding 5+5CFU courses.

Excellence in Research (MSc Thesis)



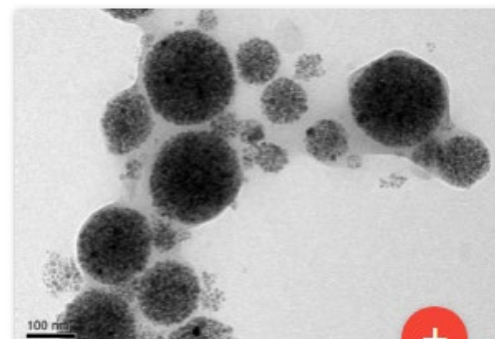
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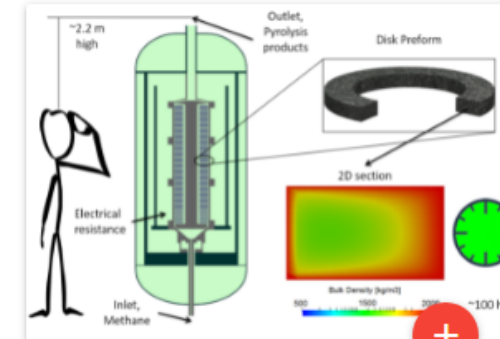
AOCL
Applied Organic Chemistry
Laboratory



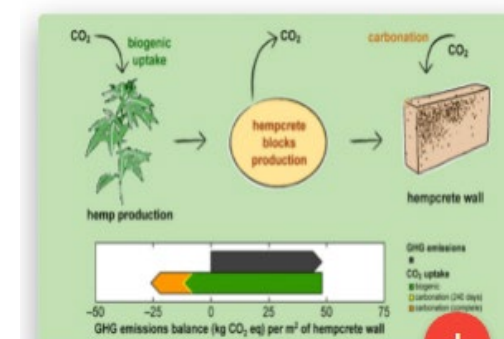
BiocatLab
Laboratorio di Biocatalisi per la
Sintesi Organica



CFALab
Laboratorio di Chimica Fisica
Applicata



CRECK
Chemical Reaction Engineering
and Chemical Kinetics Group



Mat4En2
Materiali per l'Energia e
l'Ambiente



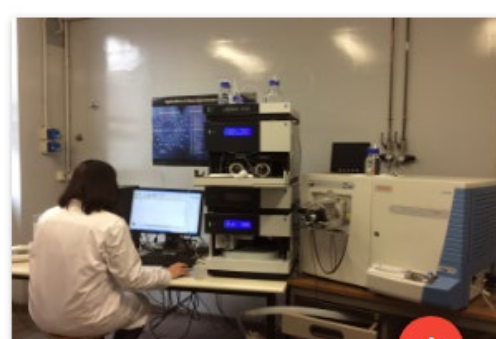
eRAM Lab
experimental Risk Assessment
and Management Lab



Fluoritech
Fluoritech Laboratory



GASP
Group on Advanced Separation
Processes & GAS Processing



ISCaMaP
Innovative Sustainable
Chemistry and Materials and
Proteomics



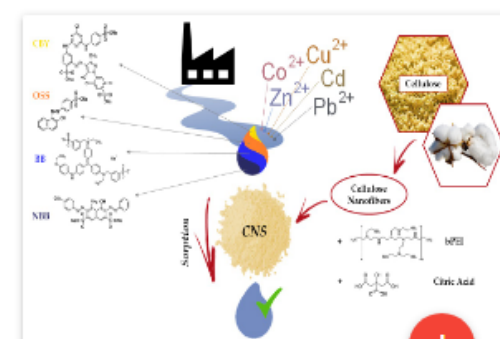
**Laboratory
of Catalysis and
Catalytic Processes** **LCCP**



NMR Group
NMR Group



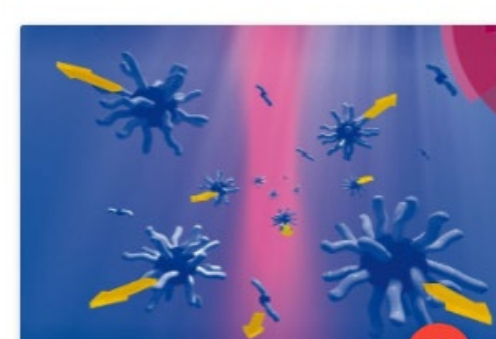
Olfattometrico
Laboratorio Olfattometrico



OrganicsCM Lab
Organic Synthesis, Catalysis, and
Materials Laboratory



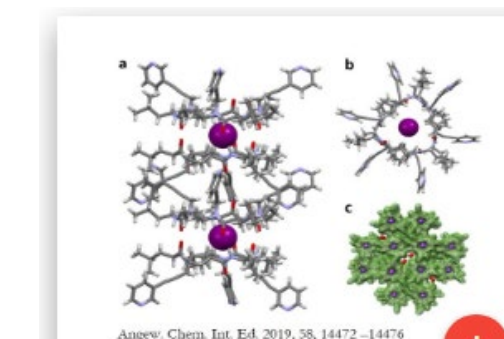
SEE lab
Surface and Electrochemical
Engineering Laboratory



Soft Matter
Laboratorio Soft Matter



SUPER TEAM
Sustainable Process Engineering
Research Team



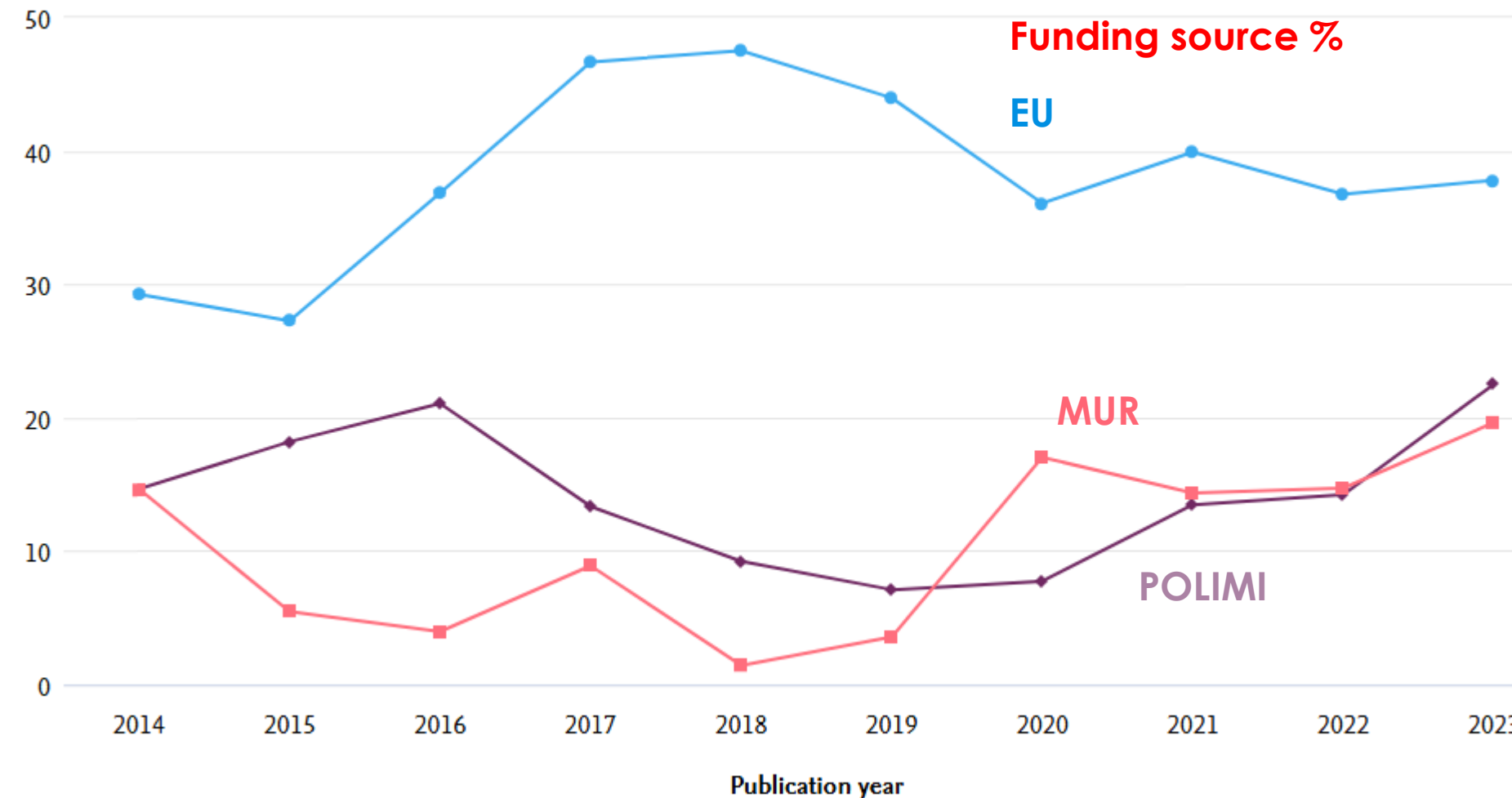
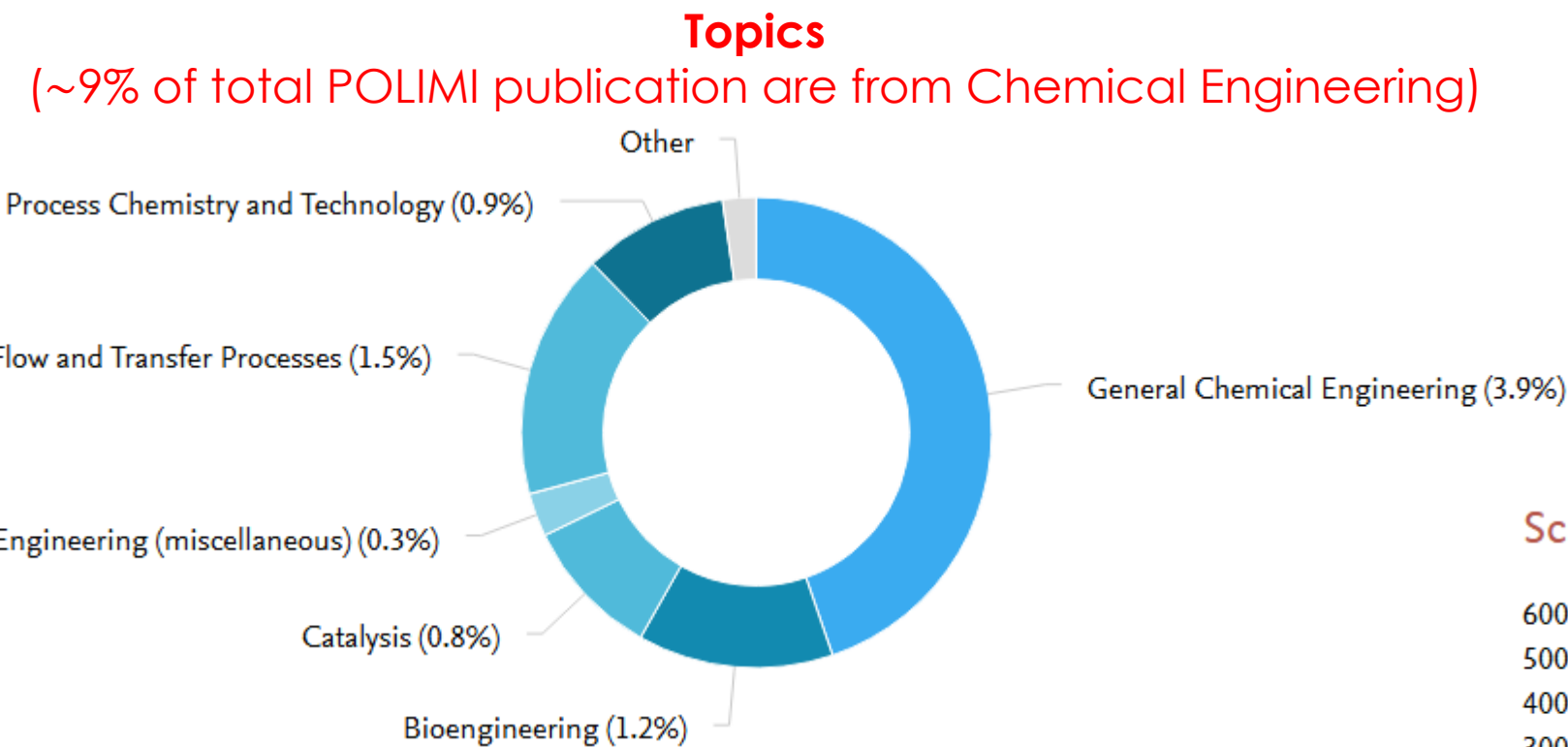
SupraBioNanoLab
Laboratory of Supramolecular
and Bio-Nanomaterials



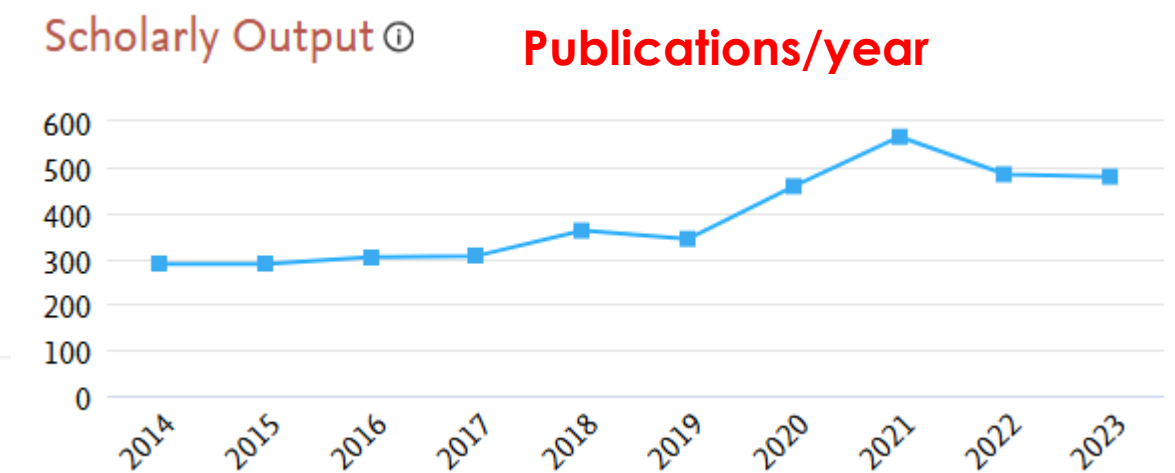
SurfaceLAB
Laboratorio di Ingegneria delle
Superfici ed Elettrochimica
Applicata "Roberto Piontelli"

Excellence in Research (Areas)

- Chemical process design and optimization
- Industrial separation processes
- Heterogeneous catalysis
- Homogeneous catalysis
- Sustainable process design
- Energy & sustainable energy
- Renewable energy
- Circular economy processes
- Environment and pollution mitigation
- Chemical reaction engineering
- Applied physical chemistry
- Polymers chemistry
- Applied chemical kinetics
- Odour monitoring and modelling
- Drug delivery
- Risk and safety in process industry
- Nanomaterials
- Materials
- Organic and inorganic chemistry
- Analytical chemistry
- Surface chemistry
- Electrochemistry

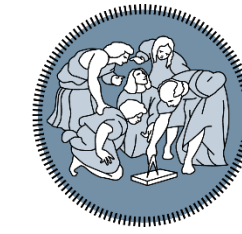


Source: scopus.com
Years: 2014-2023
Num. Documents: >3876

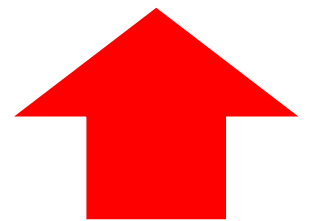


Scopus®

How to enroll? Access requirements



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6.1 Admission requirements

Bachelor Degree (EQF Level 6) or Comparable Qualification

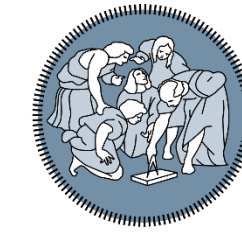
- Admission to the Master's Degree is subject to an evaluation process to verify the candidate's suitability.
- The Evaluation Committee will base its decision on the analysis of the academic career.
- Exceptional elements proven by adequate documentation may justify non-compliance with the indicated criteria.

Application for Admission

Requirements for Career Evaluation:

- Bachelor's Degree or higher qualification (e.g. MSc).
- Conditional evaluation for first-level students if the degree is expected to be obtained within 6 months.
- **a1)** Academic career requirements **(for Polimi students)**:
 - 105 ECTS with a weighted average $\geq 25/30$ by the end of the 2nd year.
 - Degree obtained within 4 academic years from enrollment.
- **a2)** Academic career requirements **(for any student)**: graduation at the Bachelor of Science no later than 31 October of the **sixth year** after the first enrolment in an Italian University

How to enroll? Access requirements



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Number of Years to Obtain the First Level Degree

Calculation of the number of years (N):

- N = half the number of semesters from the first enrollment to obtaining the degree.
- Examples:
 - Enrollment in September 2020 – Degree by October 2023: $N = 3$.
 - Enrollment in September 2020 – Degree by March 2024: $N = 3.5$.
- N must be ≤ 6 for admission to the Master's Degree (see a2 above).

Correct admission threshold (SC)

Calculation of the correct threshold:

- $SC = S + k * (\min(M, N) - 4)$
- $k = 1, M = 6, S = 22$.

b) Average graduation mark not below SC (does not apply if a1 satisfied)

Additional Admission Requirements

c) English Language Proficiency: Must be documented before enrollment through the English section of the Online Admission Test or by presenting certificates as detailed in the "Guide to English Language."

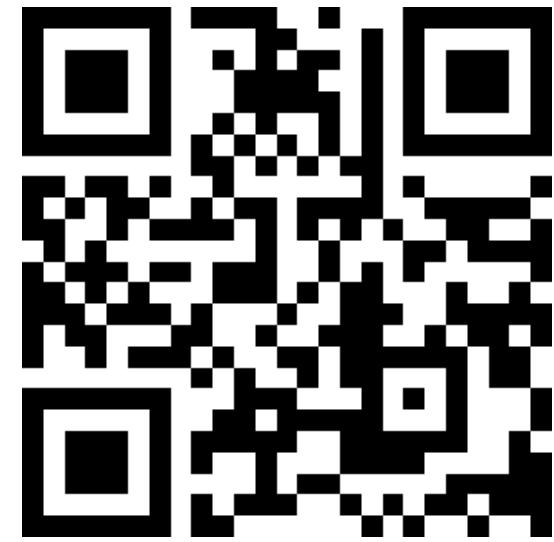
d) Absence of Curricular Integrations:

- The candidate's Bachelor's curriculum must be consistent with the Master's Degree program.
- Any required curricular integrations must be completed before enrollment.

How to enroll? Access requirements

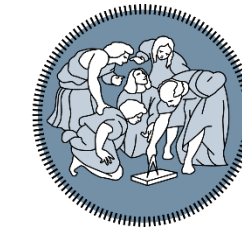


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- if the requirements stated at either point a) or b) of the above list are not satisfied, the Commission will not admit the applicant to the Master of Science degree course unless documentation testifying a proven exceptional case can be presented.
- If the requirements stated at either point c) or d) of the above list are not satisfied, the applicant will be accepted to the Master of Science degree course and enrolled, after having satisfied these conditions, by demonstrating his/her proficiency in English and/or **obtaining the necessary prerequisites identified and communicated by the Commission.**

How to enroll? Access requirements



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6.2 Requested knowledge

Consistency with Study Programme:

- The student must have a knowledge base consistent with the degree course.
- Evaluation uses the Bachelor of Science in Chemical Engineering as a reference.
- Compulsory prerequisites are assigned due to lack of consistency with the applicant's Bachelor degree.

Individual Courses subscription:

Applicants with compulsory prerequisites may attend "Individual Courses" before enrolling in the Master of Science.

Three scenarios/opportunities:

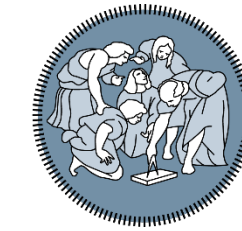
1. Earn credits by passing Master level courses (counted towards the 120 credits for the degree).
2. Earn the “*right to attend*” Master level courses (if the exam is not passed).
3. Earn credits for additional compulsory modules (not counted within the 120 credits).



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**Teaching innovation,
PhD,
internationalization,
campus life**

PoliMI Ambassadors



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<https://www.ingindinf.polimi.it/en/>

Politecnico di Milano has activated high-level training courses aimed at creating **new professional figures**, the Polimi Ambassador in **Green Technologies**, **Smart Infrastructures**, and **Inclusivity Design** which:

- have skills in specific areas consistently with the training project
- acquire digital enabling technologies in line with the profile
- master interdisciplinary tools, methods, and aptitude for a systemic vision
- develop talent to operate in interdisciplinary and multisectoral contexts, acquired through exposure, even in teams, to case studies and challenges

AMBASSADOR POLIMI
GREEN TECHNOLOGIES



AMBASSADOR POLIMI
SMART INFRASTRUCTURES

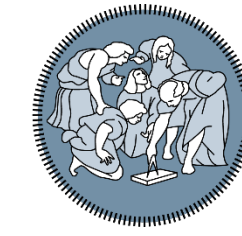
AMBASSADOR POLIMI
INCLUSIVITY DESIGN

➔ To find out more, visit the Politecnico Website:

<https://www.polimi.it/en/programmes/high-level-training-courses/green-technologies-smart-infrastructures-e-inclusivity-design>



PoliMI Ambassadors

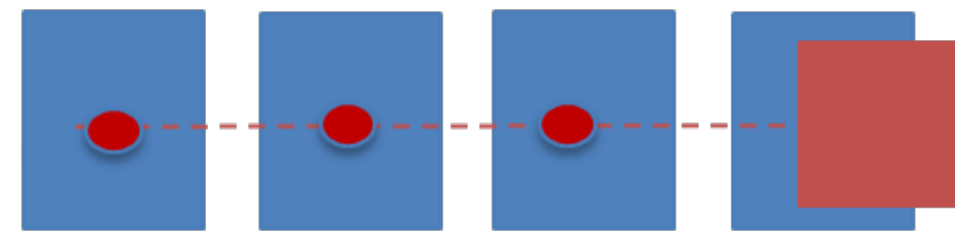


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<https://www.ingindinf.polimi.it/en/>

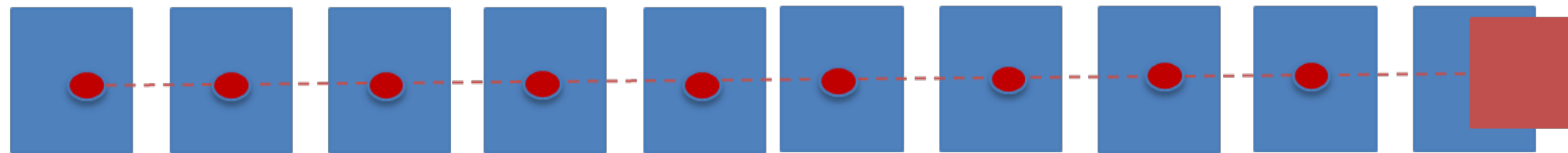
130 ECTS (120 + 10 ECTS) / 310 (300 ECTS + 10 ECTS)

MS



30 ECTS

5y



30 ECTS
green/smart/inclusivity

30 ECTS green/smart/inclusivity =

≈ 10 ECTS

Vertical Courses

(topics characterizing the DP of context)

+

≈ 20 ECTS

Transversal Courses

(topics different from the ones
characterizing the DP of context)

Honours Programme in Scientific Research in Industrial Engineering - CHEMICAL



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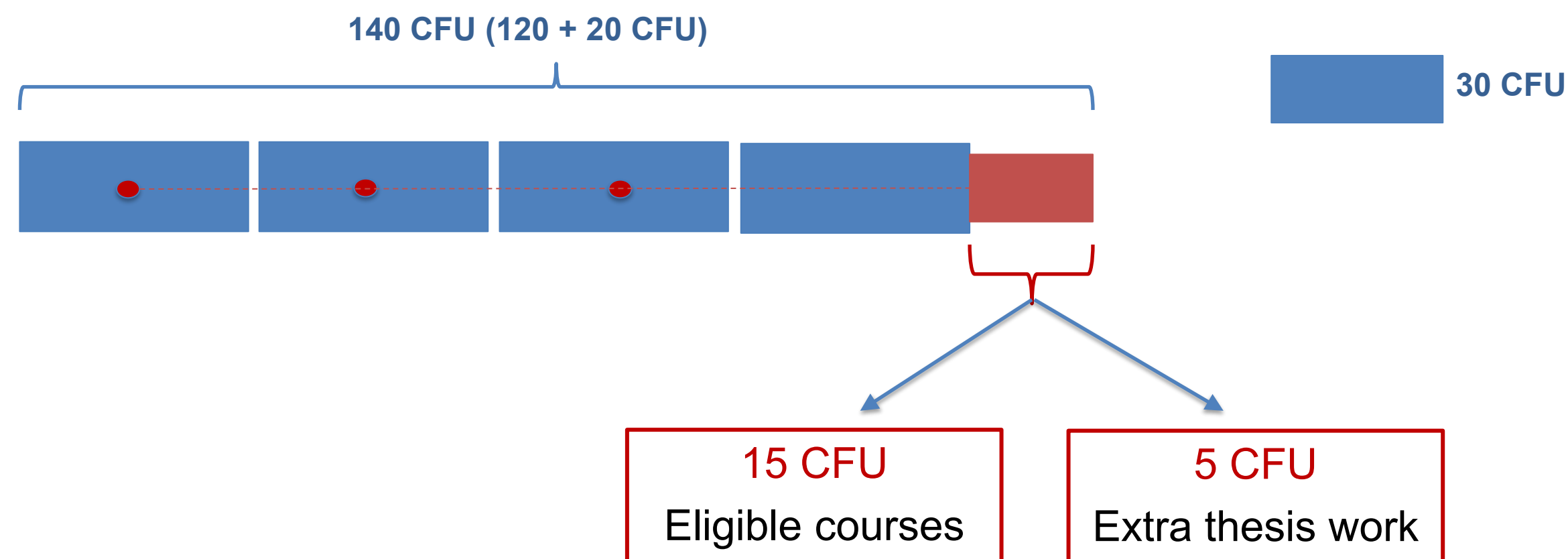
<https://www.ingindinf.polimi.it/en/>

An educational path that is part of the **Politecnico di Milano high education training strategy** and is targeted to students with a strong predisposition for **study and research**, with the aim to improve these skills and **train industrial engineers who can enter the fields of scientific and technological research**

It includes:

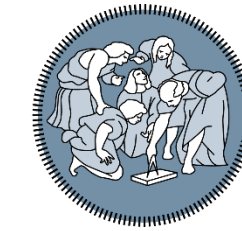
- additional in-depth training activities
- carrying out an in-depth analysis on the laurea magistrale final work with significant scientific research results.

The **Honours Programme in SCIENTIFIC RESEARCH IN INDUSTRIAL ENGINEERING** will be reported in the Student's Diploma Supplement



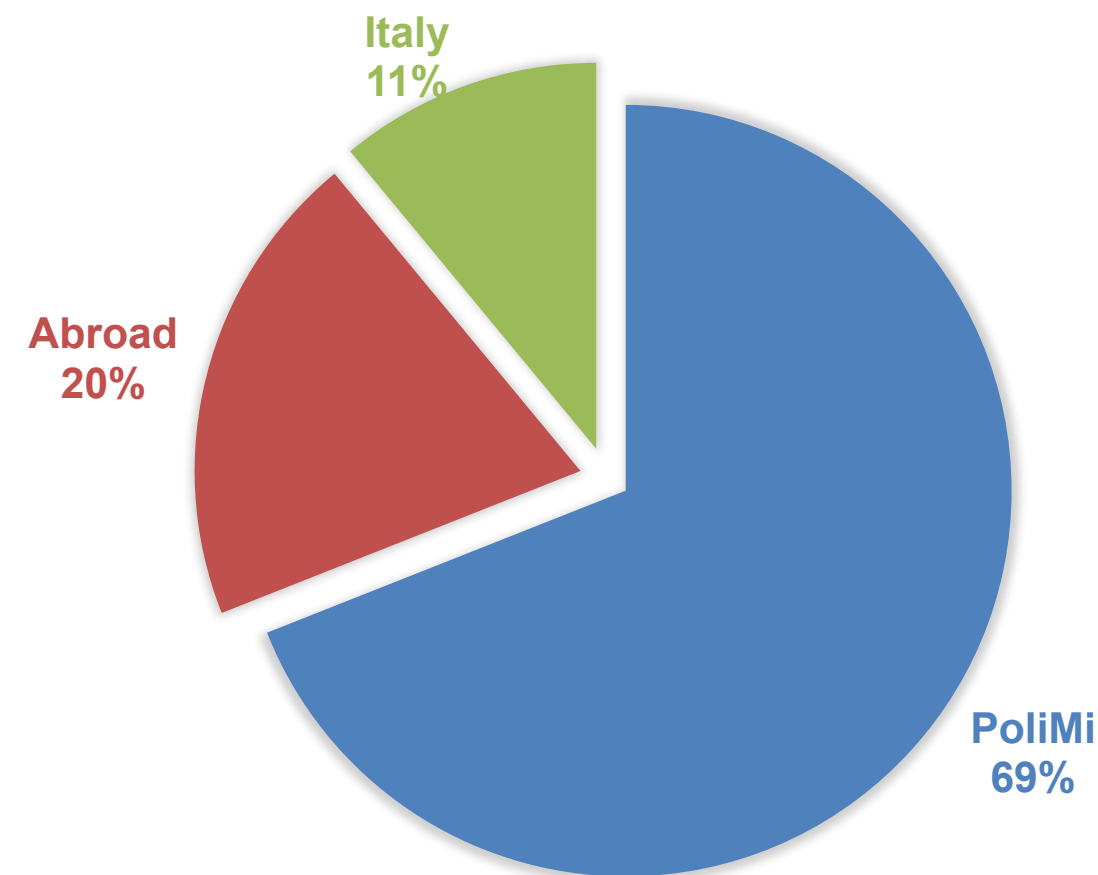
<https://www.polimi.it/en/programmes/high-level-training-courses/honours-programme-scientific-research-in-industrial-engineering>

International Mobility (3I)



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Where are PoliMi Master Students from?



Some number on «Exchange programs»

	incoming	outgoing
Erasmus+	938	730
Extra EU Bilateral Agreements	487	263
Double Degrees	288	142

IDEA League

leading European education and research
in science and technology



ALLIANCE 4 TECH



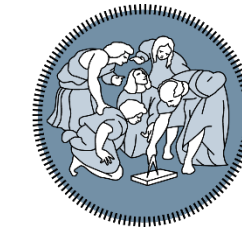
Strategic
networks of
European
Technical
Universities



Strategic agreements
with top Chinese
Universities

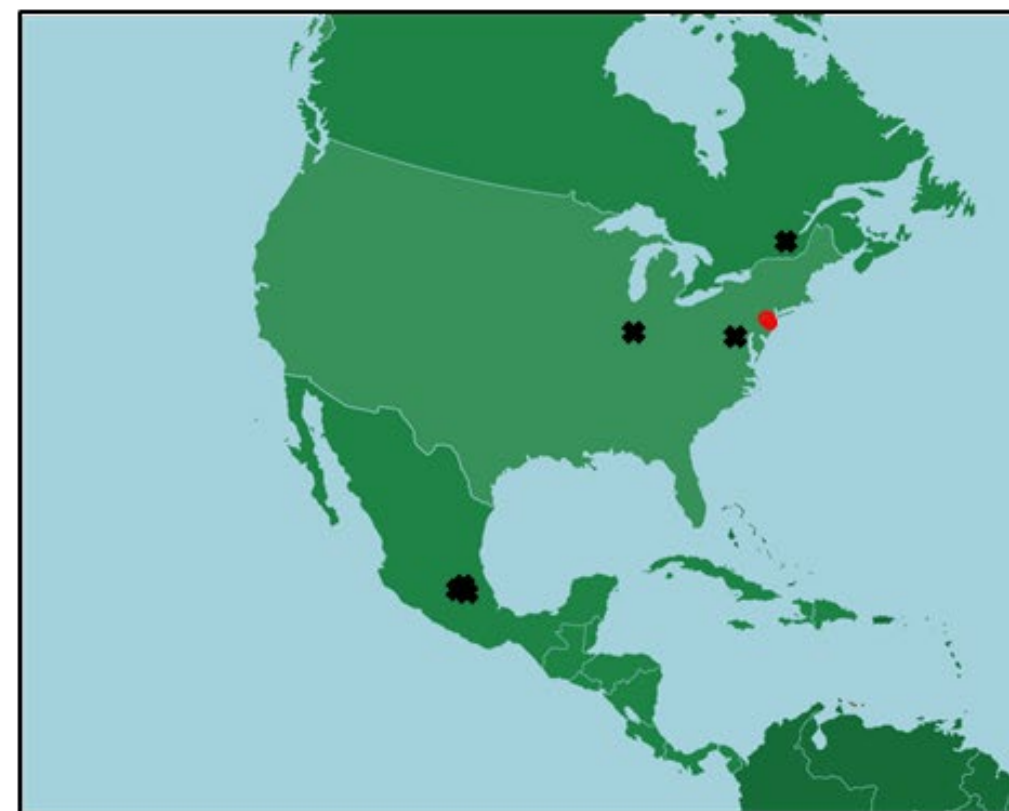
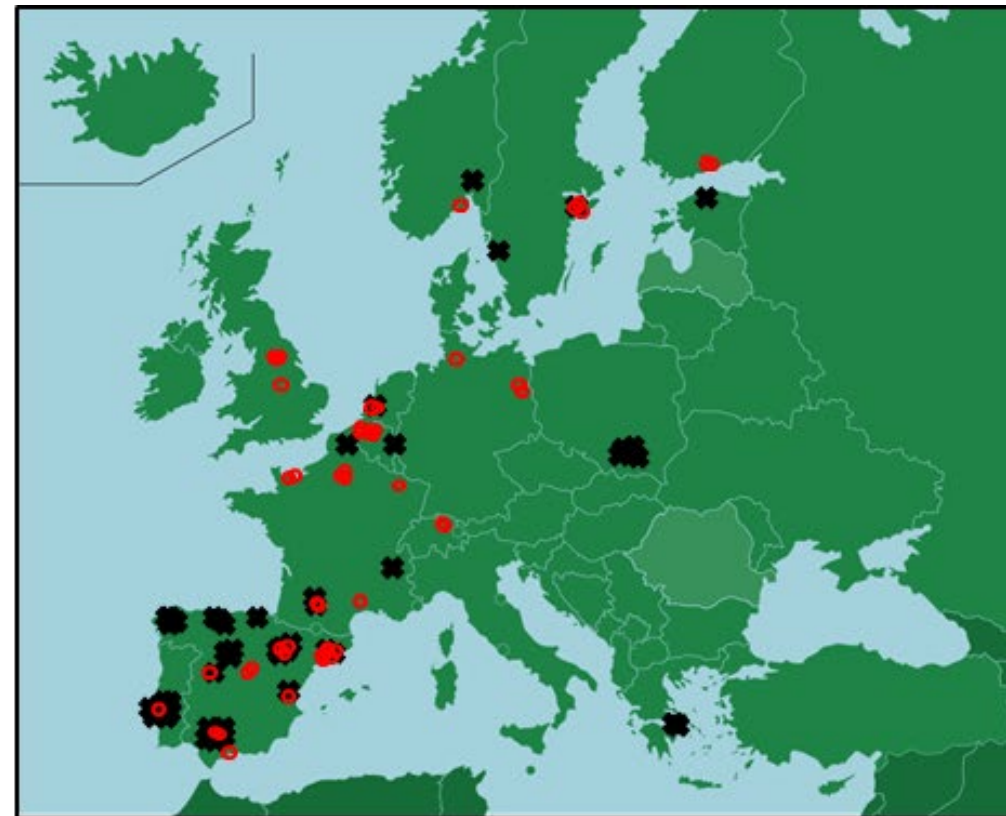


International Mobility (ChemEng)



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An international and multicultural environment...



- ✖ Incoming students Chemical Engineering
- Outgoing students Chemical Engineering

Why an experience abroad?

- ✓ To learn a new language
- ✓ To benefit from cultural diversity
- ✓ To become citizens of the World
- ✓ To deepen your knowledge
- ✓ To share your knowledge and your culture

Exchange Programs @ PoliMi

- ✓ Erasmus (EU, Mundus, Nazionale)
- ✓ Bilateral Agreements (UE and Extra-UE)
- ✓ Double Degree (UE and Extra-UE)
- ✓ Free mover

PhD in Industrial Chemistry and Chemical Engineering



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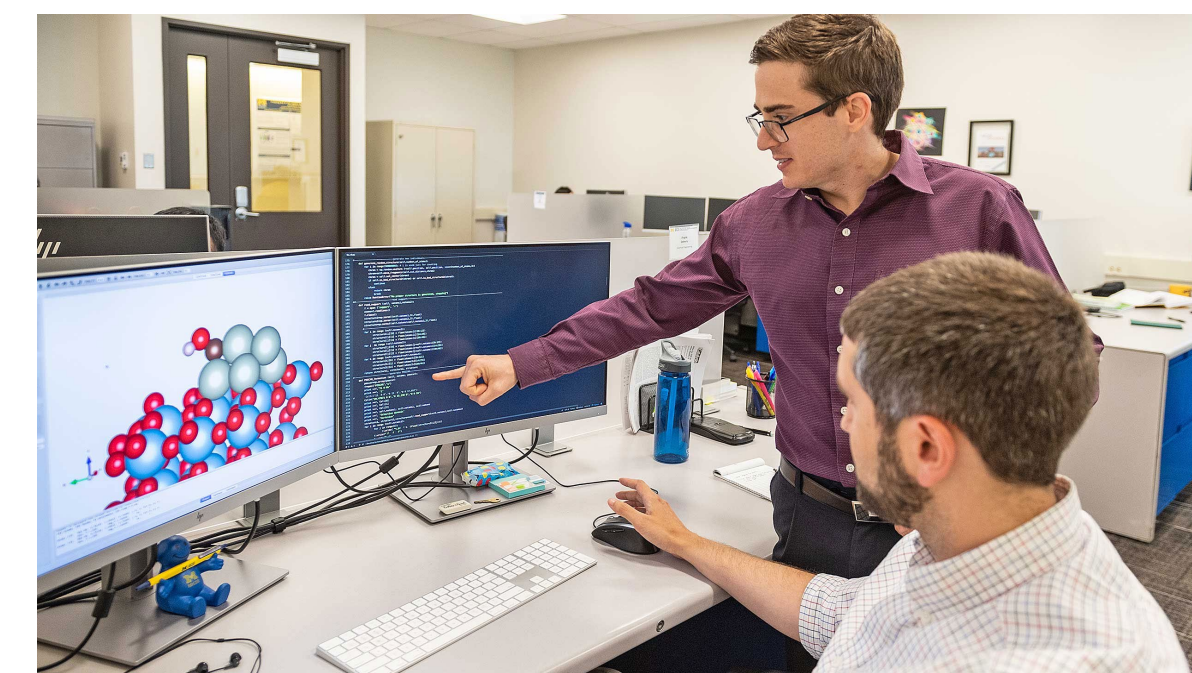
<http://phd.chem.polimi.it/>
<http://www.dottorato.polimi.it/>

The **Ph.D. Programme in Industrial Chemistry and Chemical Engineering** offers students and executives opportunities to **develop solutions to global challenges by performing cutting-edge research** in three main areas:

- **Energy, Safety and Environment**
- **Health and Life Sciences**
- **Smart and Sustainable Industry**

Research activities span from the **nano/micro scale up to the macro scale** and cover any fields of Industrial Chemistry and Chemical Engineering: from **chemical synthesis** to the characterization and transformation of matter, the development of **new materials**, to safe and **innovative technologies** for **sustainable process development** and design, from **experimental research to numerical modelling** of chemical processes and phenomena.

The Doctoral Programme... a strategic resource for Industry



Contacts

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LINK UTILI PRIVACY  

SCUOLA DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE

Corso di Studio in Ingegneria Chimica

HOME INGEGNERIA CHIMICA FUTURI STUDENTI DIDATTICA LABORATORI DOCENTI LAVORO CONTATTI

Laboratori didattici

online 19/07 ore 11
MASTER IN CHEMICAL ENGINEERING
NEW CHALLENGES NEW TECHNOLOGIES
Master in Chemical Engineering – Video
25 Luglio 2022

online 19/07 ore 11
MASTER IN CHEMICAL ENGINEERING
NEW CHALLENGES NEW TECHNOLOGIES
Master in Chemical Engineering
14 Luglio 2022

CHIMICA una buona scelta
QS Ranking 2022
22 Aprile 2022

LIVE WEBINAR
L'Ingegneria Chimica, la Sostenibilità dei Processi e dei Prodotti
15 Aprile 2022

Open Day 2022 – Un grande successo
12 Aprile 2022

<http://www.ccs-chimica.polimi.it/>

Contacts



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<http://www.ccs-chimica.polimi.it/contatti>

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chemengpolimi



chemeng_polimi



Chemical Engineering - Politecnico di Milano





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