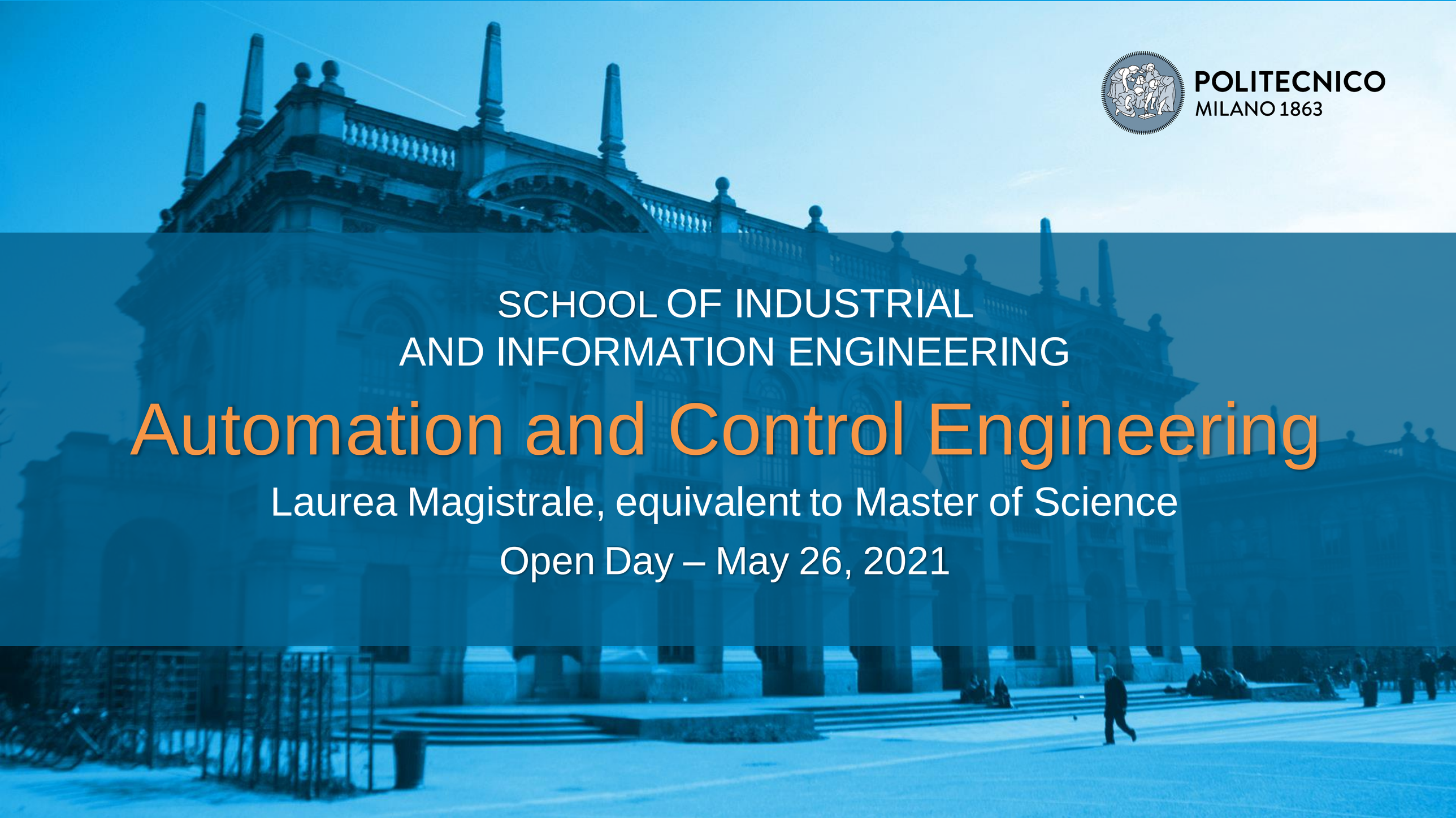


POLITECNICO
MILANO 1863

SCHOOL OF INDUSTRIAL
AND INFORMATION ENGINEERING

Automation and Control Engineering

Laurea Magistrale, equivalent to Master of Science

Open Day – May 26, 2021

Politecnico di Milano

POLITECNICO
MILANO 1863

More than **47.500** students including about **7.300** international students

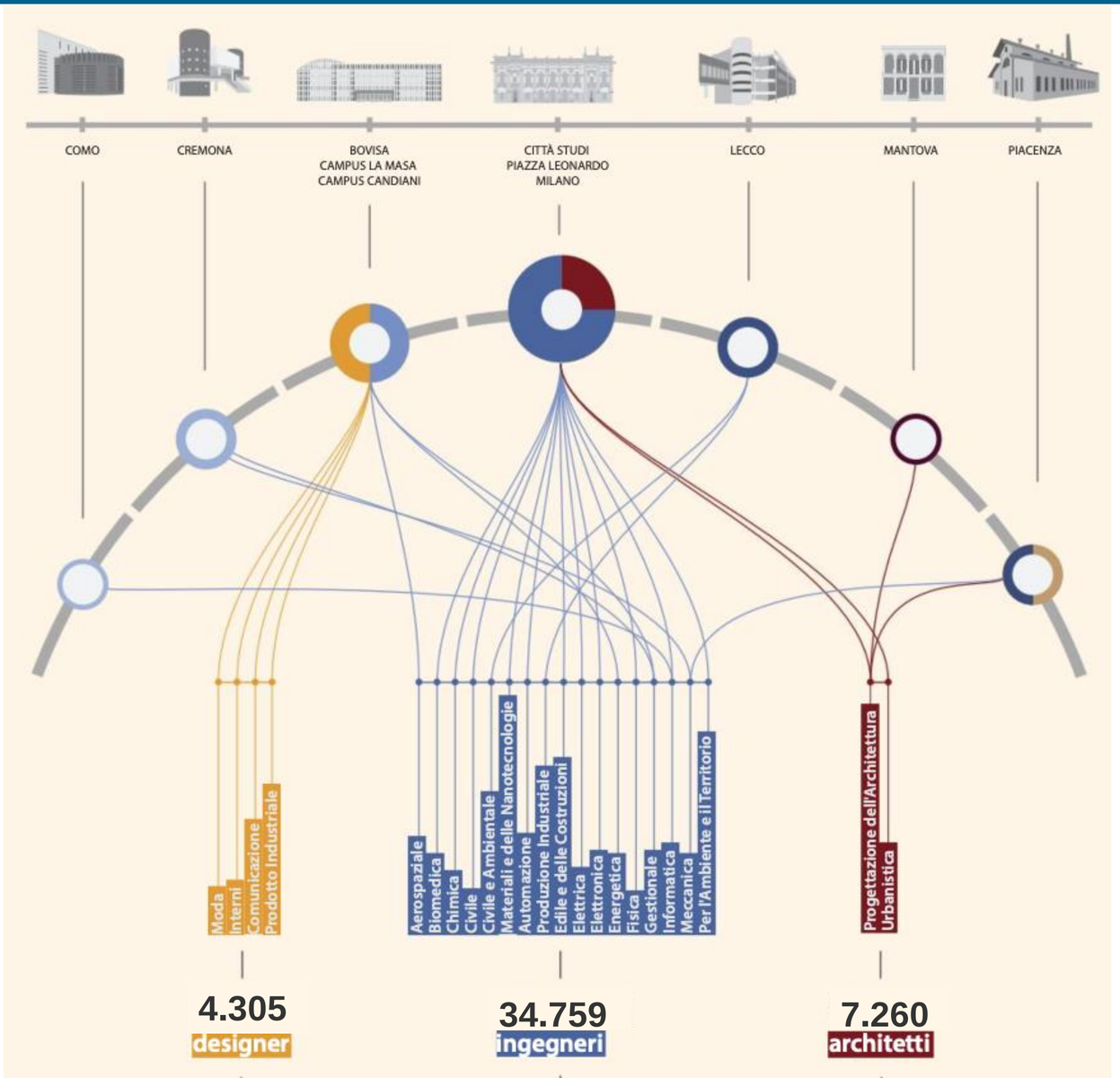
More than **1.400** teachers and more than **1.200** administrative and technical support staff

4 Schools
- Architecture Urban Planning Construction Engineering
- Design
- Civil, Environmental and Land Management Engineering
- Industrial and Information Engineering

12 Departments

Classified **n. 1** in Italy, **n. 7** in Europe, **n. 20** in the world under the ‘’Engineering & Technology’’ category
QS World University Ranking 2020

Politecnico di Milano: Campuses



Como

Cremona

Milano Bovisa

Milano Leonardo

Lecco

Mantova

Piacenza

- engineering
- design
- architecture

Automation Engineering

Study Programme in Automation Engineering:

- offered within the School of Industrial and Information Engineering
- based at Milano Leonardo Campus

Chair and vice-chair of the programme

POLITECNICO MILANO 1863

Chair

Prof. Maria Prandini
DEIB, building 20
tel: 02 2399 3441
e-mail: maria.prandini@polimi.it

Vice-chair

Prof. Alberto Leva
DEIB, building 20
tel: 02 2399 3410
e-mail: alberto.leva@polimi.it

Automation Engineering

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1 YEAR

2 YEAR

3 YEAR

Automation Engineering Laurea
(equivalent to Bachelor of Science)

1 YEAR MS

2 YEAR MS

Automation and Control Engineering
Laurea Magistrale
(equivalent to Master of Science)

PhD

PhD Programme in Information
Technology, Systems and Control

Why studying Automation Engineering?

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Automation is everywhere and is increasing in many domains, which makes the Automation Engineer a highly in-demand professional figure

Why studying Automation Engineering?

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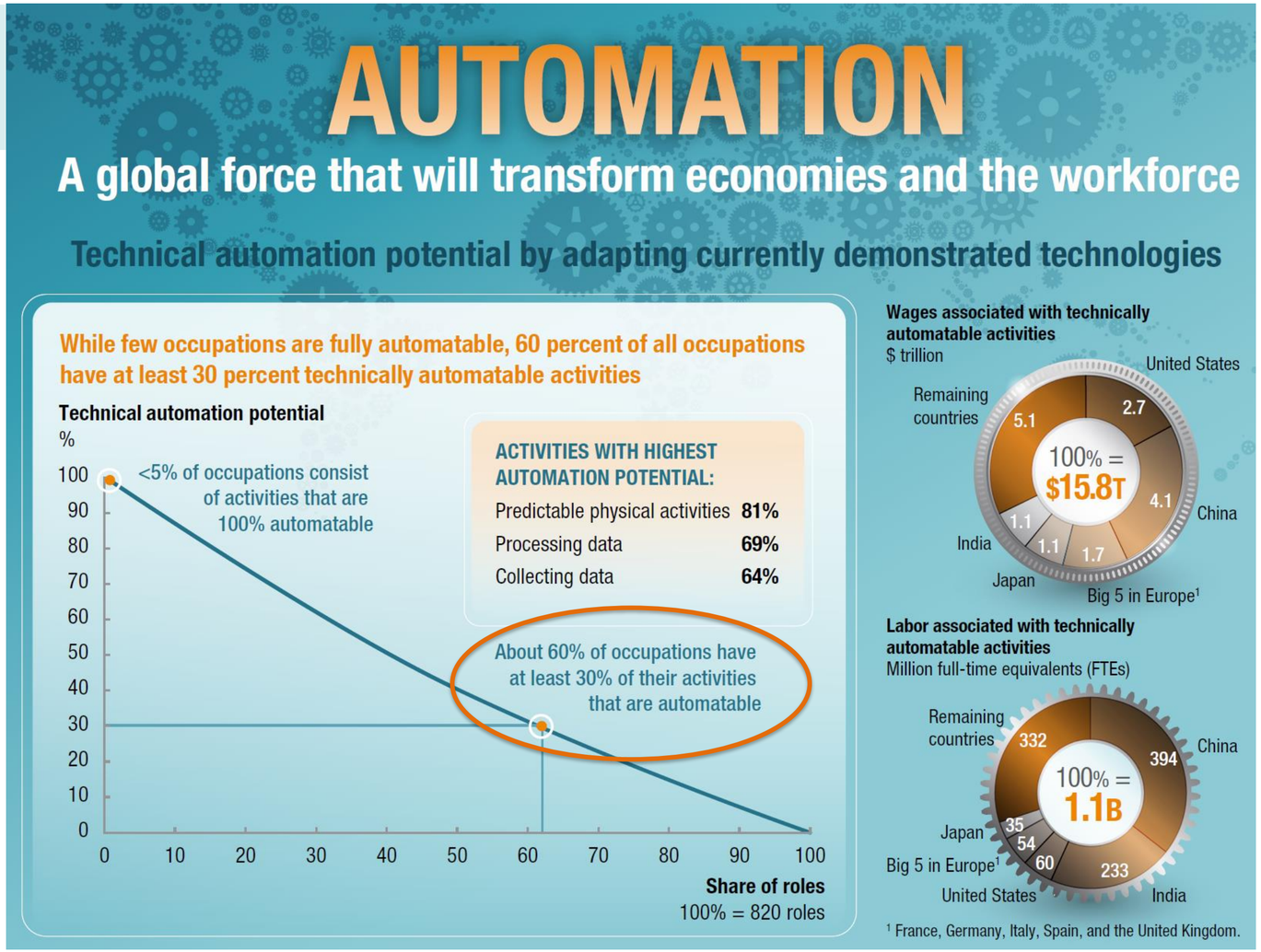
A FUTURE THAT WORKS: AUTOMATION, EMPLOYMENT, AND PRODUCTIVITY



From the Executive Summary
McKinsey Global Institute
January 2017

Attractiveness of the MSc programme

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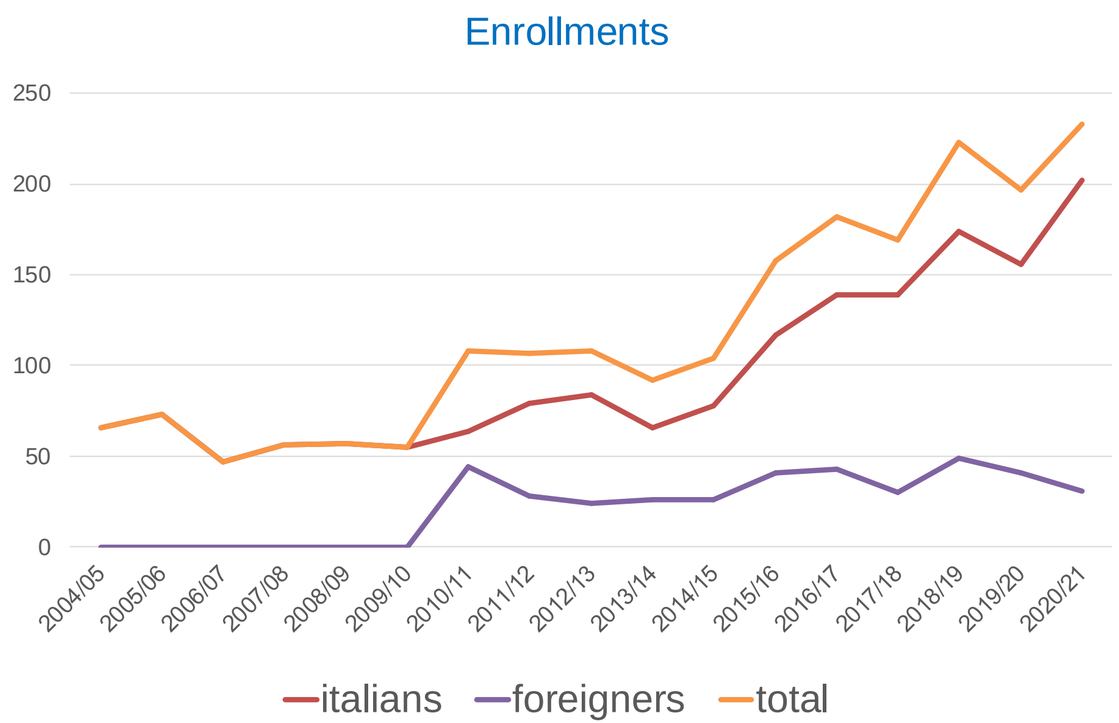
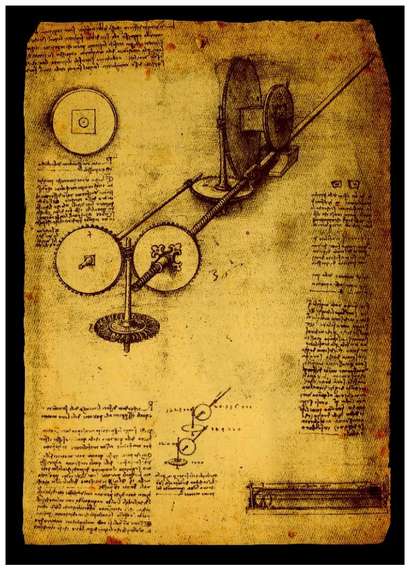
Year	Italians	Foreigners	Total
2004/05	66	0	66
2005/06	73	0	73
2006/07	47	0	47
2007/08	56	0	56
2008/09	57	0	57
2009/10	55	0	55
2010/11	64	44	108
2011/12	79	28	107
2012/13	84	24	108
2013/14	66	26	92
2014/15	78	26	104
2015/16	117	41	158
2016/17	139	43	182
2017/18	139	30	169
2018/19	174	49	223
2019/20	156	41	197
2020/21	202	31	233



Learning objectives

The Automation and Control Engineering MSc Programme aims at training engineers …



… able to design, implement and manage automation systems characterized by a strong technological content, in inherently multidisciplinary contexts

Competences of our MSc students

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- solid background on the mathematical tools necessary for the analysis and design of complex automation systems
- a thorough understanding of the technologies and processes typical of industrial sectors where automation plays an increasingly important role
- ability to explore and evaluate the offer and market trends in the field of instrumentation and system components, in view of innovative applications
- familiarity with the most advanced techniques for identification and learning from data, simulation, optimization and control of dynamical systems of all kinds, and ability to integrate them in an effective and creative manner
- aptitude for teamwork and ability to embrace the principles and methods of organization

Programme requirements

How is the programme organized?

Single curriculum, organized in two years, four semesters, with courses taught in English, except for a few optional ones in Italian.

Most courses are held at Leonardo Campus, a few at Bovisa Campus.

Programme requirements

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What are the rules to obtain your MSc degree?

You have to earn 120 credits:

- 60 credits of mandatory courses:
  - 45 on qualifying subjects (systems and control, identification, converters and drives, applied mechanics)
  - 15 credits on subsidiary subjects (computer science, electronics, measurements, industrial production technologies)
- 40 credits of complementary courses
- a final thesis corresponding to 20 credits on new methods and techniques for automation and control with application in high-tech areas

60 credits of mandatory courses

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1st year

Course title	Credits (CFU)	Semester
Computer aided manufacturing	10	1
Dynamics of mechanical systems	10	1
Model identification and data analysis	10	1
Advanced and multivariable control	10	2
Dynamics of electrical machines and drives	10	2
Complementary courses	10	2

2nd year

Course title	Credits (CFU)	Semester
Software Engineering (for Automation)	5	2
Automation and Control Laboratory	5	2
Complementary courses	30	1, 2
Thesis	20	1, 2

40 credits of complementary courses

POLITECNICO MILANO 1863

1st year

Course title	Credits (CFU)	Semester
Computer aided manufacturing	10	1
Dynamics of mechanical systems	10	1
Model identification and data analysis	10	1
Advanced and multivariable control	10	2
Dynamics of electrical machines and drives	10	2
Complementary courses	10	2

2nd year

Course title	Credits (CFU)	Semester
Software Engineering (for Automation)	5	2
Automation and Control Laboratory	5	2
Complementary courses	30	1, 2
Thesis	20	1, 2

Course offer

Courses can be classified in the following categories:

- methodological, on advanced techniques of learning from data, identification, simulation, optimization and control
- technological, on process instrumentation including advanced actuation and measurement systems for control applications
- application-oriented, on the application of control and automation to key areas such as industry, energy, and transportation
- experimental and professionalizing, including a lab course and a project work with companies to reach a full mastery of methods and techniques, and improve soft skills

Automation and Control Laboratory

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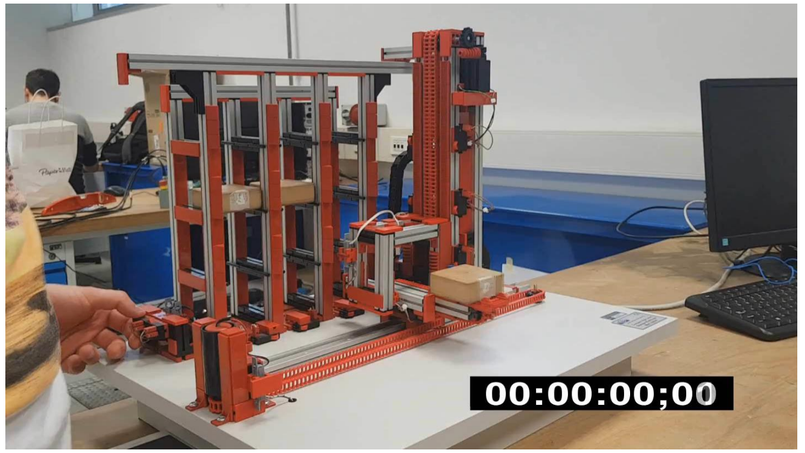
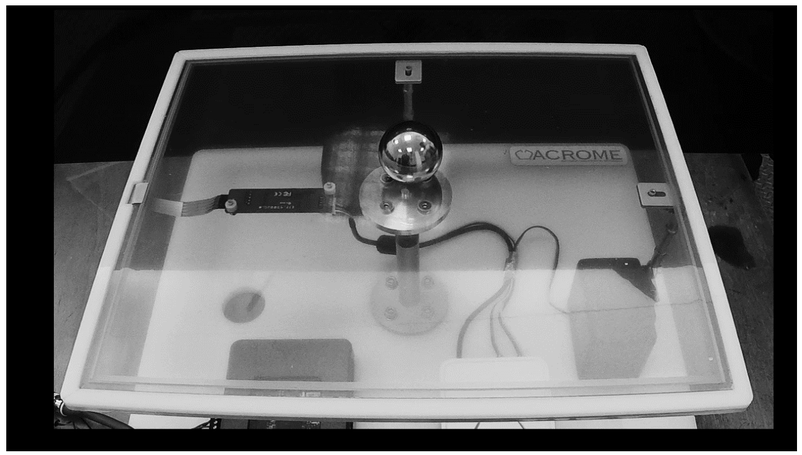
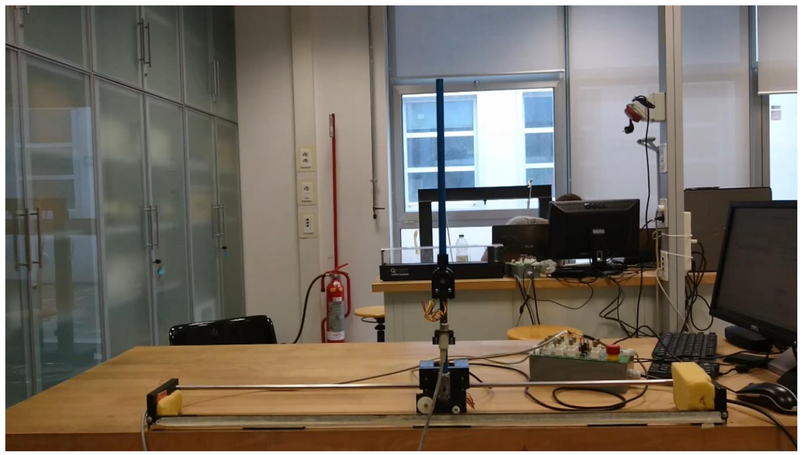
- course held in a lab
- students divided in groups, working on various experimental set-ups
- mandatory course in the second semester of the second year







Project work

Project works are innovative courses in collaboration with companies

- companies propose open innovation topics, on design activities in the field of automation and control
- each project work is run under the supervision of an academic and an industrial tutor
- students work in small groups during the semester
- at the end they prepare a report and discuss the project in front of the academic and industrial tutors and the other students

Project work

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Examples of proposed topics

- Control system for an autonomous micro-vehicle for urban goods delivery
- Development of a communication and control system for the supervisory control of tethered drone formations
- Development of an electronic suspension control system for bicycle
- Intelligent collaborative robotics

Complementary courses on core topics

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Course title	Credits (CFU)
Advanced measurement systems for control applications	5
Advanced process control	5
Advanced topics in automation and control engineering	5
Automation and control in autonomous vehicles	5
Automation and control in electric and hybrid vehicles	5
Automation of energy systems	5
Constrained numerical optimization for estimation and control	5
Control of industrial robots	5
Control of mobile robots	5
Data driven control system design	5
High-tech entrepreneurship	5
Networked control	5
Nonlinear control	5
Numerical analysis	5
Power electronics and supplies	5
Production systems control	5
Robust control	5
Safety in automation systems	5
Simulation techniques and tools	5
Systems theory	5
Vibration control and diagnostics of mechanical systems	5

Complementary courses on core topics

Course title	Credits (CFU)
Advanced measurement systems for control applications	5
Advanced process control	5
Advanced topics in automation and control engineering	5
Automation and control in autonomous vehicles	5
Automation and control in electric and hybrid vehicles	5
Automation of energy systems	5
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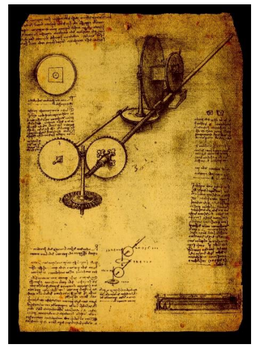
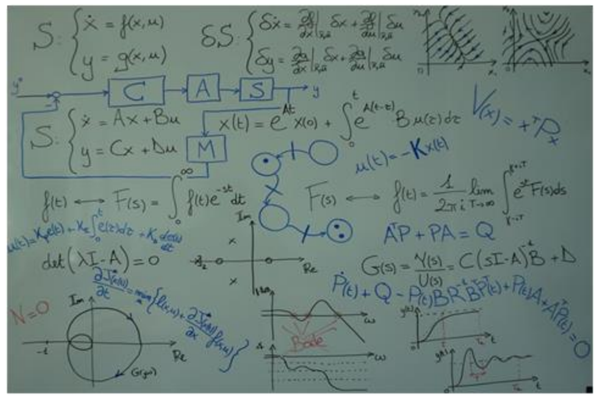
Nonlinear control	5
Numerical analysis	5
Power electronics and supplies	5
Production systems control	5
Robust control	5
Safety in automation systems	5
Simulation techniques and tools	5
Systems theory	5
Vibration control and diagnostics of mechanical systems	5

- methodological courses



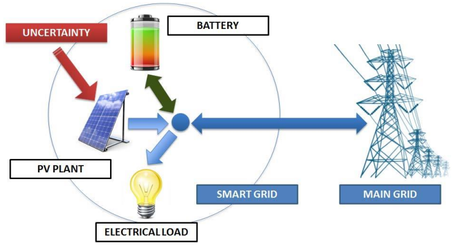


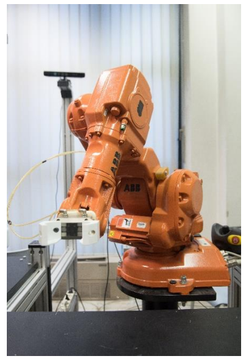
Complementary courses on core topics

POLITECNICO MILANO 1863

Course title	Credits (CFU)
Advanced measurement systems for control applications	5
Advanced process control	5
Advanced topics in automation and control engineering	5
Automation and control in autonomous vehicles	5
Automation and control in electric and hybrid vehicles	5
Automation of energy systems	5
Constrained numerical optimization for estimation and control	5
Control of industrial robots	5
Control of mobile robots	5
Data driven control system design	5
High-tech entrepreneurship	5
Networked control	5
Nonlinear control	5
Numerical analysis	5
Power electronics and supplies	5
Production systems control	5
Robust control	5
Safety in automation systems	5
Simulation techniques and tools	5
Systems theory	5
Vibration control and diagnostics of mechanical systems	5

- application-oriented courses





Thesis

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	Thesis with reviewer “Tesi”	Thesis without reviewer “Tesina”
Expected outcome	an innovative project in the field of automation and control	a (maybe less) innovative project in the field of automation and control
Reviewer required	yes	no
Maximum increment for the final grade	7/110	4/110

Study plan

- Each student is expected to present his/her study plan
- If the study plan is compliant with the study plans suggested in the Educational Rules, it is automatically approved (“pre-approved”)
- Otherwise the study plan will be considered “autonomous” and then subjected to approval by a committee

Study plan Committee

Prof. Simone Garatti
DEIB, building 20
tel: 02 2399 3650
e-mail: simone.garatti@polimi.it

Prof. Marcello Farina
DEIB, building 20
tel: 02 2399 3599
e-mail: marcello.farina@polimi.it

Training beyond the MSc programme

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Massive Online Open Courses (MOOCs) – www.pok.polimi.it

POLIMI portal of free online courses to support students in their academic and professional career. A certificate of attendance is provided if the final test is passed.

Passion in action – www.polimi.it/en/programmes/innovative-teaching/

open participation teaching activities that the Politecnico offers to its students to support the development of transversal, soft and social skills. Acquired skills will be accredited on the Diploma Supplement.

High level training courses

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HONOURS PROGRAMME HP-SR in Information Technology

Honours Programme ‘Scientific Research in Information Technology’

- extracurricular programme to train MSc students in conducting scientific research in Information technology
- the Honours Programme title is reported in the students' transcript together with a description of the conducted activities
- three main topics for Automation and Control Engineering:
  - Theory and application of control systems
  - Optimization and control of complex systems
  - Robotics, Mechatronics, and Industrial Automation

www.honours-programme.deib.polimi.it

High level training courses

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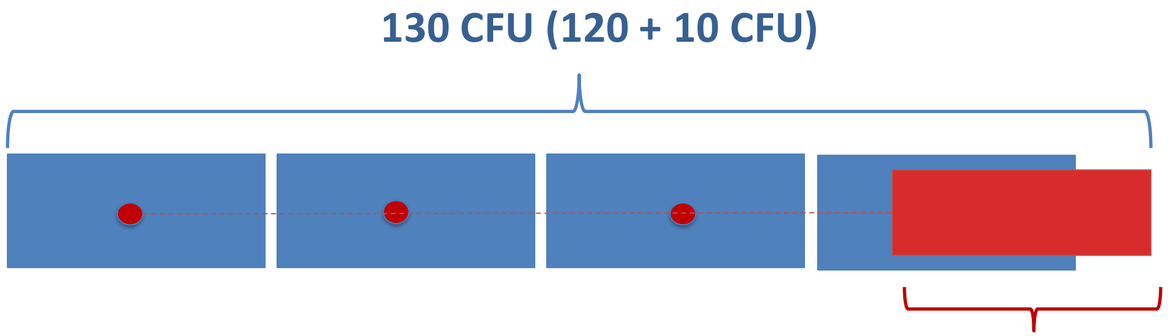
AMBASSADOR POLIMI SMART INFRASTRUCTURES

AMBASSADOR POLIMI GREEN TECHNOLOGIES

Starting from 21-22, Polimi is activating high-level training courses to create new professional figures in Green Technologies and Smart Infrastructures within some MSc study programmes



30 CFU smart/green with 20 CFU of transversal courses on topics different from the ones characterizing the specific MSc programme

www.polimi.it/en/polimi-ambassador

High level training courses

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AMBASSADOR POLIMI SMART INFRASTRUCTURES

AUTOMATION AND CONTROL ENGINEERING
BIOMEDICAL ENGINEERING
COMPUTER SCIENCE AND ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
TELECOMMUNICATION ENGINEERING
MANAGEMENT OF BUILT ENVIRONMENT
CIVIL ENGINEERING

AMBASSADOR POLIMI GREEN TECHNOLOGIES

CHEMICAL ENGINEERING
ENERGY ENGINEERING
MANAGEMENT ENGINEERING
MATERIALS ENGINEERING AND NANOTECHNOLOGY
NUCLEAR ENGINEERING
BUILDING AND ARCHITECTURAL ENGINEERING
ENVIRONMENTAL AND LAND PLANNING ENGINEERING

The Smart/Green Ambassador certification will be reported in the Diploma Supplement and an electronic badge will be issued.

www.polimi.it/en/polimi-ambassador

Initiatives for our students

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Degree awards for the Best MSc Thesis in Automation and Control Engineering entitled to

- prof. Claudio Maffezzoni
  for the Best thesis on the Application of advanced techniques for automation and control in highly technological fields

- prof. Nicola Schiavoni
  for the Best thesis on the Development of innovative methodologies for automation and control

Automation and Control Industry Seminars

held by people working in different industries and addressed primarily to students enrolled in the third year of the Bachelor Degree and both years of the Master Degree, started this year

Services and opportunities

POLITECNICO MILANO 1863

CareerService
www.careerservice.polimi.it

Career Service – www.careerservice.polimi.it/

the service for connecting the job market and students and for supporting students in their first job search

POLIHUB
INNOVATION DISTRICT & STARTUP ACCELERATOR
BY FONDAZIONE POLITECNICO DI MILANO

POLIHUB – www.polihub.it

the startup District & Incubator that gives you opportunities for turning your ideas into a startup company

Services and opportunities

POLITECNICO MILANO 1863

- lodging, dining, sport activities

- scholarships, remunerated collaborations, associations and cultural activities

www.polimi.it/en/services-and-opportunities/

Support and listening services

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Multi Chance Poli Team – polimi.it/en/footer/rights/disabilities-and-spld/
Service for Students with Disability and Learning Disabilities

PoliPsi – polimi.it/en/services-and-opportunities/other-services-and-opportunities/support-and-listening-services/polipsi/
Counselling and Psychological and Psychotherapeutic Support Service for students

Tutoring – ingindinf.polimi.it/en/1/translate-to-english-studenti/services/tutoring
activities designed to guide and assist students throughout their studies, removing obstacles to successful course attendance

International mobility

Opportunities for gaining experience abroad:

- study mobility
  attending courses or working on the thesis
- double degree
  two degrees in three years with at least 60 CFU of exams @POLIMI

A first call at the end of the year, and one around April for re-assignment

www.polimi.it/en/services-and-opportunities/experience-abroad/

Active agreements

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International context: on this page are listed, broken down by country, Erasmus exchange programs, bilateral international agreements and double degree agreements.

Academic Year	2021/2022
School	School of Industrial and Information Engineering (225)
Programme	Automation and Control Engineering (473)
Exchange type	All exchange programmes

Refresh

Australia

University ID	University	Exchange programmes type
AUS KENSING01	University Of New South Wales	Bilateral Agreement Extra Ue

Austria

University ID	University	Exchange programmes type
A WIEN02	Technische Universitat Wien	Erasmus Programme

Belgium

University ID	University	Exchange programmes type
B LEUVEN01	Katholieke Universiteit Leuven	Erasmus Programme
B LOUVAIN01	Universite' Catholique De Louvain	Erasmus Programme
B BRUXEL04	Universite' Libre De Bruxelles	Erasmus Programme

Brazil

University ID	University	Exchange programmes type
BRA SAOPAUL04	Universidade De Sao Paulo	Bilateral Agreement Extra Ue

www4.ceda.polimi.it/manifesti/manifesti/controller/extra/ScambiInternazionaliPublic.do

Preparing a learning agreement

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www.polimi.it/servizi-online/

Preparing a learning agreement

POLITECNICO MILANO 1863

SCHOOL OF **INDUSTRIAL AND INFORMATION ENGINEERING**

Rules to
- prepare a learning agreement
- convert marks

SCHOOL TEACHING STUDENTS

Home / Students / Opportunities / Experience Abroad

Experience abroad

The Politecnico di Milano offers the School's students the opportunity to participate in high quality international projects based on joint programmes and special agreements with many partner universities.

Experience abroad opportunities

Further information on experience abroad (in italian)

You can also contact you programme coordinator for more details and to arrange an experience abroad.

www.ingindinf.polimi.it/en/1/translate-to-english-studenti/opportunities/experience-abroad

International mobility Beep channel

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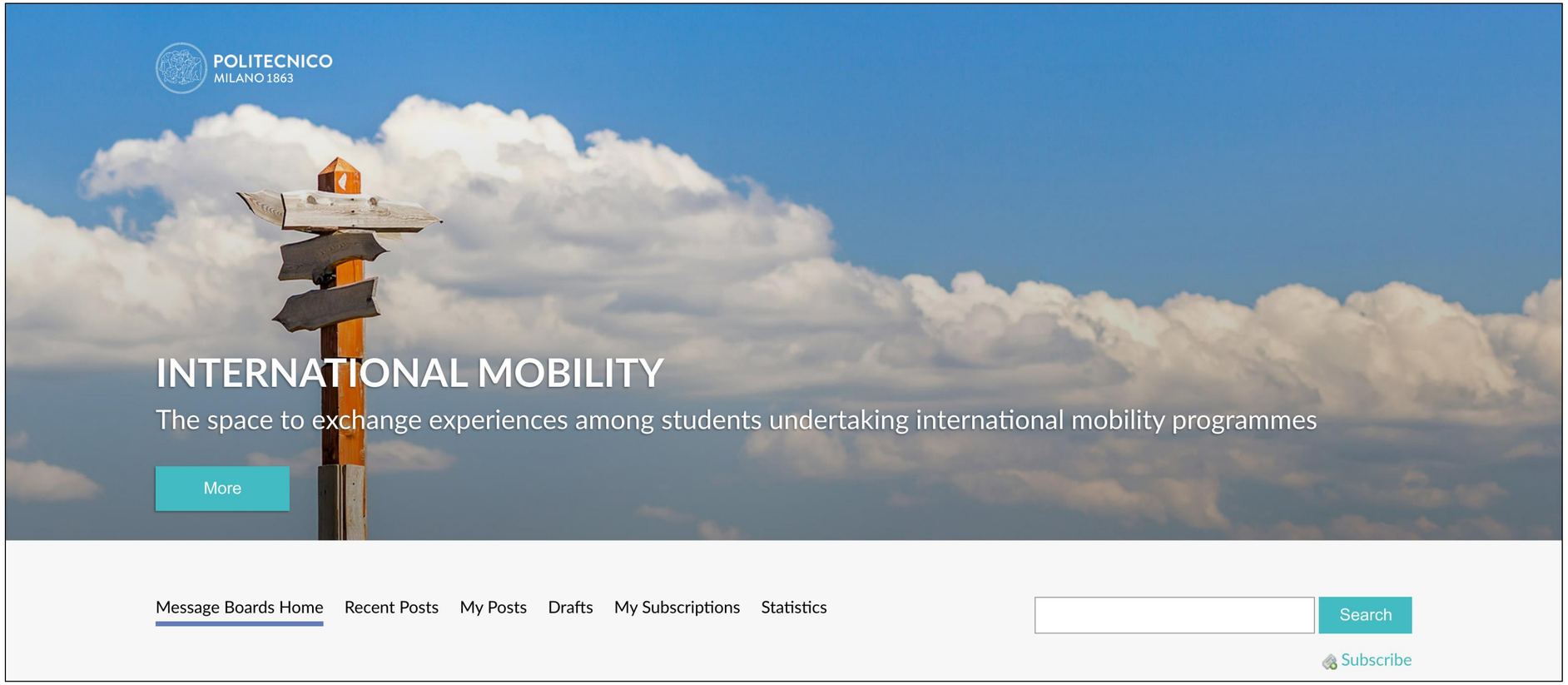

beep.metid.polimi.it/web/mobilita-internazionale

International mobility Committee

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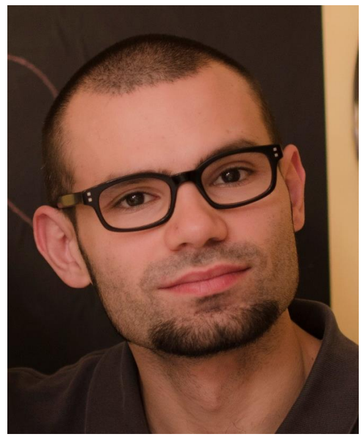
Prof. Luca Bascetta
DEIB, building 20
tel: 02 2399 3440
e-mail: luca.bascetta@polimi.it

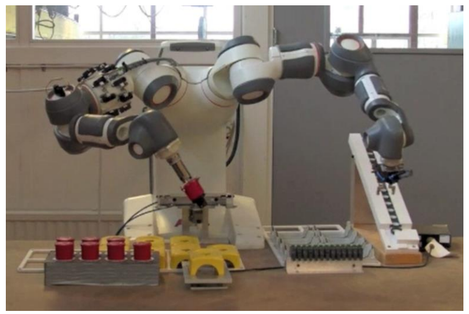
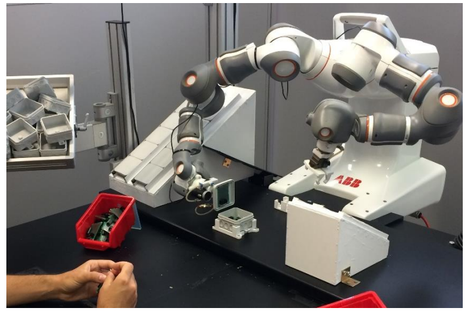
Prof. Matteo Corno
DEIB, building 20
tel: 02 2399 4037
e-mail: matteo.corno@polimi.it



Some research areas

- automation in vehicles and transportation systems
- collaborative robotics and mechatronics
- automation in energy systems and integration of renewables






Automation in vehicles and transport

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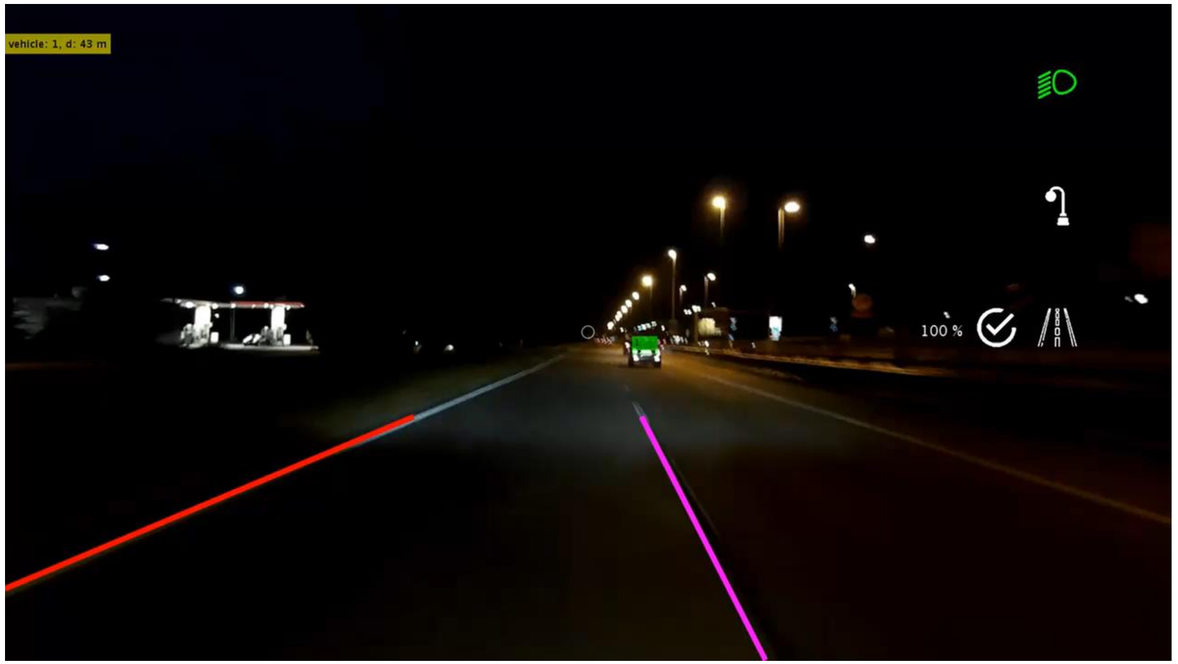
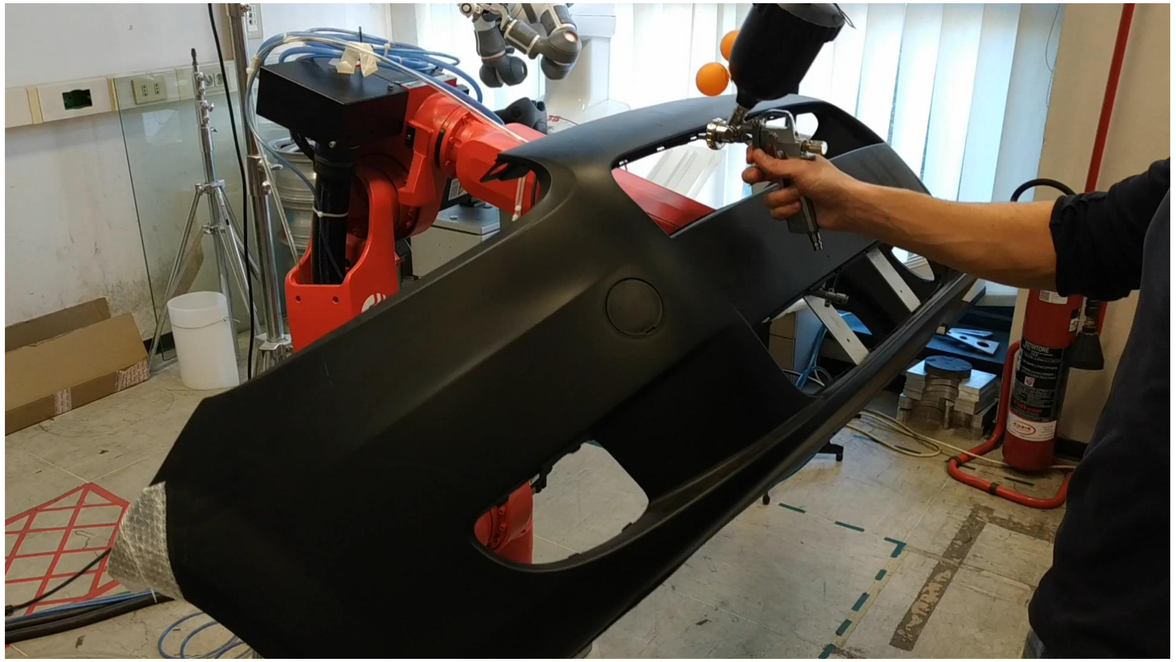
self-charging e-bike



advanced driver assistance system

Collaborative robotics

dual-arm robot



industrial manipulator

Mechatronics

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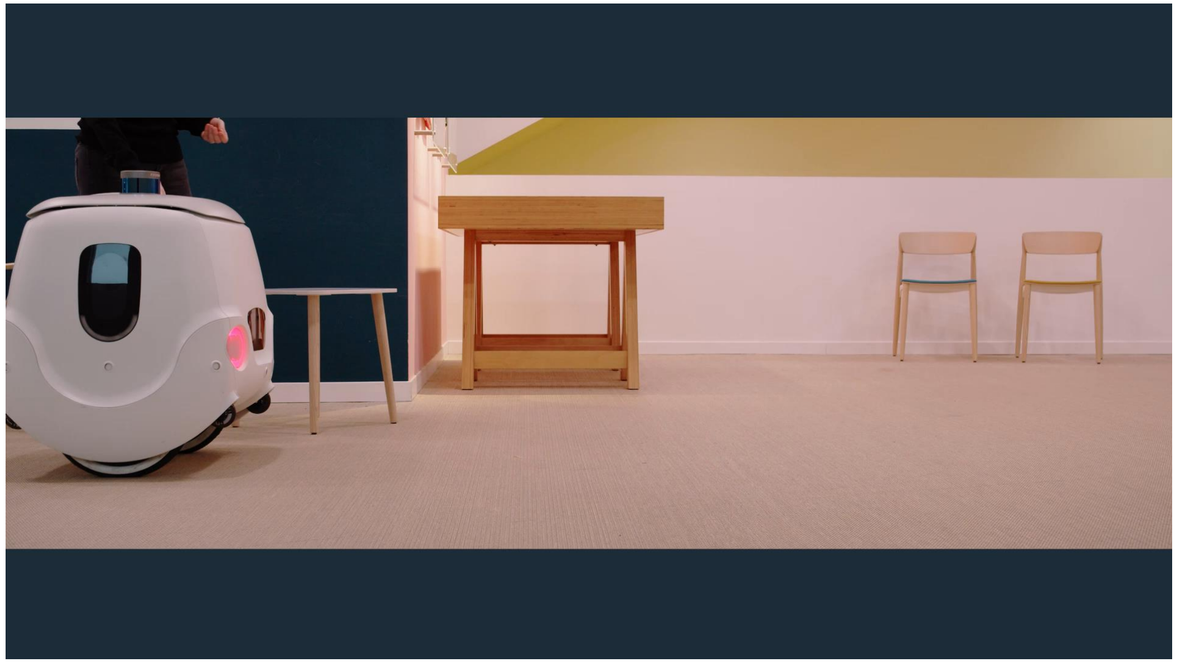
in the countryside



in town

Energy systems and renewables

power kite to convert wind energy into electricity

Study of methods and algorithms

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New applications call for the development of suitable methods and algorithms for

- prediction
- learning from data
- planning and trajectory tracking
- predictive control in presence of constraints
- verification and control of cyber-physical systems
- distributed optimization of interconnected systems

…

Collaborations: some companies

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ABB
Alfa Romeo
Alstom
Aprilia
Argotractors
BLM Group /Adige
Bosch
Brembo
COMAU
Ducati
Eldor
Electrolux
E-Novia
ENEL

Ferrari
Fives-Intralogistics
Gruppo Camozzi
Huawei
Hyundai
INDEVA
Lamborghini
Leonardo spa
Magneti Marelli
MAN
Maserati
MV-Agusta
NUM
Peugeot Motorcycles

Piaggio
Pirelli
RSE
Safim
Same-Deutz-Fahr
Schneider Electric
Siemens
Tenaris
TT-Control/Hydac
Unipol
Vodafone
Whirlpool
Yamaha
Yanmar

Career opportunities

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- companies that produce hardware and software for automation
- companies that design and manufacture machines or plants with high level of automation
- companies that manage automated production plants
- corporations or companies that manage large-scale networks and services
- engineering and consulting firms that design complex and technologically advanced plants and systems
- start-up companies, possibly with the support of PoliHub, the Innovation District & Startup Accelerator of Politecnico di Milano

Offers for Automation Engineers

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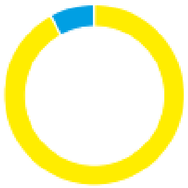
TOTAL OFFERS: 3446

Jobs: 2638	●	**77%**
Internship: 808	●	**23%**

WHERE THEY WORK



Italy	**92%**	●
Abroad	**8%**	●

TOP 10 SECTORS

Electronics and Automation	**17%**
Metallurgy and Metalworking	**13%**
ICT	**11%**
Mechanics and Installation	**10%**
Business Consultancy	**7%**
Automotive	**4%**
Energy Oil&Gas	**4%**
Business Services	**4%**
Scientific Research and Dev	**4%**
IT Consultancy	**4%**

Career Service – 2019

Employment statistics

POLITECNICO MILANO 1863

2020 Survey – MSc students graduated in 2018

EMPLOYED

97%

1 YEAR AFTER GRADUATION

EMPLOYED WITHIN 6 MONTHS

92%

PERCENTAGE CALCULATED ON EMPLOYED WITHIN 1 YEAR AFTER GRADUATION

Employment statistics

POLITECNICO MILANO 1863

2020 Survey – MSc students graduated in 2014

EMPLOYED

100%

SATISFIED WITH THEIR MSC TITLE

95%

100% PERMANENT CONTRACT

Admission to the MSc Programme

POLITECNICO MILANO 1863

Requirements

- Laurea (BSc) degree – Graduation needed by the enrollment deadline:
  September 15, 2021 (1st semester) or February 23, 2022 (2nd semester)
- English proficiency certificate
- CV related conditions
  - BSc degree in Automation Engineering at POLIMI:
    average mark ≥ 22/30
  - BSc degree in other programmes offered by the School of Industrial and Information Engineering at POLIMI:
    average mark ≥ 23/30
  - All the others:
    admission decided on a case-by-case basis by the admission committee, based on the resumé and the final mark of the BSc programme

Students from POLIMI

Admission to the MSc Programme

POLITECNICO MILANO 1863

Requirements

- Laurea (BSc) degree – Graduation needed by:
  November 30, 2021 (1st semester)
  or
  March 31, 2022 (2nd semester)
- English proficiency certificate
- CV related conditions
  - Admission decided on a case-by-case basis by the admission committee, based on the resumé and the final mark of the BSc programme

Students from other Italian Universities

Admission to the MSc Programme

POLITECNICO MILANO 1863

Notes on possible alignment duties/curricular integrations

- If the background of a candidate is lacking important topics in the characterizing subjects (Automatic control, Applied Mechanics, Electrical machines and drives), some “alignment duties” (max 15 credits) may be assigned.
  These duties contribute to the 120 credits of the MSc programme.
- If the background preparation is particularly incomplete, the committee may assign also some “curricular integrations”, to be fulfilled as “single courses” before the enrollment.

Admission to the MSc Programme

POLITECNICO MILANO 1863

Notes on the English certificate

- Requirements are the same for the whole School of Industrial and Information Engineering

Test / certification	Level required
ETS – TOEFL (Test of English as a Foreign Language)	
• Paper based (total score)	≥ 547
• Computer based (total score)	≥ 210
• Internet based (total score)	≥ 78
ETS – TOEIC (Test of English for International Communication)	≥ 720
CAMBRIDGE	≥ FCE – GRADE B or ≥ CAE – GRADE C
IELTS (International English Language Testing System)	≥ 6
TRINITY COLLEGE	≥ ISE II

- If your BSc degree was taught in English, you can upload a document certified by your university attesting the teaching language instead of the language certificate.
- The documentation must be submitted at the enrollment stage

MSc programme admission Committee

POLITECNICO
MILANO 1863

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Other members: Alan Facchinetti, Simone Formentin, Riccardo Scattolini

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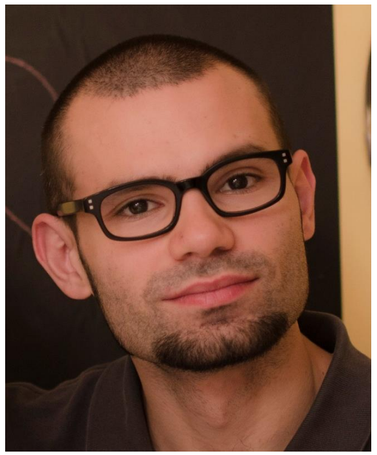
Questions?

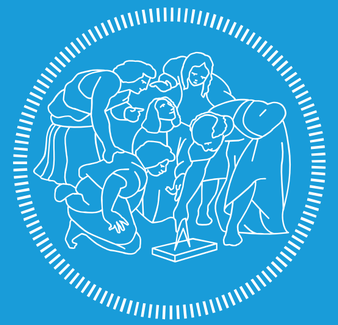
POLITECNICO MILANO 1863

Maria Prandini

Paolo Bolzern



Matteo Corno



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