

Automation and Control Engineering MSc Programme

Welcome meeting – September 11, 2019

Chair and vice-chair of the programme

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



POLITECNICO MILANO 1863

MSc Programme in Automation and Control Engineering

Committee for the Admission to the Master Programme

Prof. Paolo Bolzern DEIB, building 20 tel: 02 2399 3598 e-mail: paolo.bolzern@polimi.it



Other members: Roberto Corradi, Simone Formentin, Riccardo Scattolini



Learning objectives

Our goal is to **train experts who understand and contribute to the technological evolution**, using the results of the research for the **design of innovative automation systems in inherently multidisciplinary contexts and in highly competitive industries**.

Learning objectives

Students will acquire

- the mathematical tools necessary for the analysis and design of complex automation systems
- a thorough understanding of the technologies and processes typical of some of the major industrial sectors where automation plays an increasingly important role
- the 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 the identification, analysis, simulation, optimization, and control of dynamical systems of all kinds, as well as the ability to merge them in an effective and creative manner, tailored to the specific characteristics of the problems to be solved
- aptitude for teamwork and the ability to embrace the principles and methods of organization

Career opportunities

The automation market covers, increasingly, all sectors of industrial production and services.

The automation engineer typically operates in:

- companies producing and selling automation systems (both hardware and software)
- companies that use automated production plants or that manage highly complex services
- companies producing systems with high technological content
- engineering and consulting firms that design and project complex, economically challenging and technologically advanced plants and systems

Educational prerequisites

Before attending classes in the Automation and Control Engineering MSc. Programme, it is advisable that the students have a satisfactory background in:

- Linear algebra
- Automatic Control
- Engineering mechanics
- Electrical machines and drives

See the pdf file linked at

http://www.ccsatm.polimi.it/laurea-magistrale-2/criteri-di-ammissione/

Programme requirements

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

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- 40 credits of complementary courses
- a final thesis corresponding to 20 credits

How is the programme organized?

- the programme is organized in two years, four semesters
- most of the courses are held at Leonardo Campus, a few at Bovisa Campus.

Structure of the Study Programme





Structure of the Study Programme

1st year

2nd year

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

Schedule of courses – First semester

	Mondav	Tuesdav	Wednesdav	Thursday	Fridav	
08.15-9.15	DMS - BL.28.2.1	DMS - BL.28.2.1		CAM - BL.28.2.1		CAM: Computer Aided Manufacturing
09.15-10.15	5 DMS - BL.28.2.1	DMS - BL.28.2.1		CAM - BL.28.2.1		DMS: Dynamics of Mechanical Systems MIDA: Model Identification and Data Analysis
10.15-11.15	5 CAM - BL.28.2.1	CAM - BL.28.2.1		DMS - BL.28.2.1		
11.15-12.15	5 CAM - BL.28.2.1	CAM - BL.28.2.1		DMS - BL.28.2.1		Leonardo Campus
12.15-13.15	5					
13.15-14.15	5			DMS - BL.28.2.1	MIDA - 5.0.1	Bovisa Campus
14.15-15.15	5	MIDA - 5.0.1		DMS - BL.28.2.1	MIDA - 5.0.1	
15.15-16.15	5 MIDA – N.0.1	MIDA - 5.0.1		CAM - BL.28.2.1	MIDA - 5.0.1	
16.15-17.15	5 MIDA – N.0.1	MIDA - 5.0.1		CAM - BL.28.2.1		
17.15-18.15	5					
18.15-19.15	5					

Structure of the Study Programme

1st year 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

Programme requirements

- each student has a study plan
- study plans can be pre-approved or autonomous

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Presentations on how to fill in the study plan:

- Tuesday September 10 at 2.30 pm in Room L1.2, Bovisa Campus
- Friday September 13 at 9:30 am in Room BL27.03, Bovisa Campus

Study plan



Automation and Control Laboratory

- Course held in a lab
- Students are divided in groups, working on various experimental set-up
- The course is offered in the second semester of the second year

Automation and Control Laboratory



Automation and Control Laboratory

- Starting from 2019-20 there are two Automation and Control Laboratory Courses:
- one located at the Mechanical Engineering Department (Bovisa Campus)
- a new one located at Building n. 7 (Leonardo Campus)

Automation and Control Laboratory (Bovisa Campus)



MSc Programme in Automation and Control Engineering

Automation and Control Laboratory (Leonardo Campus)



MSc Programme in Automation and Control Engineering

Study plan



MSc Programme in Automation and Control Engineering

Study plan – Complementary courses

- Tables of suggested courses:
 - TAB1 (1st semester) and TAB2 (2nd semester)
 - TAB3 (1st semester) and TAB4 (2nd semester)
- schedules of courses in TAB1 and TAB2 will not overlap, the same is not guaranteed for courses in TAB3 and TAB4
- at least 20 credits out of 40 credits must be taken from TAB1 or TAB2 (a larger number of credits is suggested)

Courses in TAB1 and TAB2

Course titleCredits (CFU)Advanced measurement systems for control applications5Advanced process control5Automation and control in vehicles5Automation of energy systems5Constrained numerical optimization for estimation and control5Control of industrial robots5Control of mobile robots5Data driven control system design5Networked control5Noise and vibration engineering5Nourerical analysis5Project work5Production systems control5Robust control5Safety in automation systems5Simulation techniques and tools5Systems theory5Further courses5Strutter courses5		
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Further courses					



Project Work

- special course held in cooperation with companies, on design activities in the field of automation and control
- only a limited number of seats are available (15 per project)
- an application will be required (call at September)
- mainly offered at the first semester

Project Works – First semester 2019/20

Control system and actuation for an electronically active sole of a shoe - The very first active sole able to adapt its

- morphology to changes both in the external environment, like terrain, temperature or humidity, and in the dynamic state of the user: design and development of actuation, sensing and control systems Academic tutor: Prof. Sergio Matteo Savaresi – Partner company: **e-Novia S.p.A.**
- Control system for an autonomous micro vehicle for urban goods delivery A fully autonomous micro electric vehicle for urban delivery of goods: design and development of an architecture for electric powertrain, sensing and control systems Academic tutor: Prof. Matteo Corno – Partner company: YAPE S.r.I.
- Intelligent collaborative robotics Innovative functionalities for collaborative robots (cobots) based on control, prediction, and optimization technologies Academic tutor: Prof. Paolo Rocco – Partner company: Smart Robots srl

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Robust control	5
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Simulation techniques and tools	5
Systems theory	5
Further courses	







Study plan – Complementary courses

- at least 20 credits out of 40 credits must be taken from TAB1 or TAB2 (a larger number of credits is suggested)
- the residual 20 credits should be chosen from TAB1, TAB2, TAB3 and TAB4
- students can also include a maximum of 10 credits of freely chosen courses

Autonomous study plans

- Each student is expected to present his/her study plan
- If the study plan is compliant with the suggested study plans, it is automatically approved ("pre-approved")
- Otherwise the study plan will be considered "autonomous" and then subjected to approval by a committee
- In particular, if students include freely chosen courses (up to 10 credits max), then the committee will assess the adequacy of such courses with the learning objectives of the programme

Responsible for study-plans evaluations

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



It is advisable to contact Prof. Garatti or Prof. Farina before submitting an autonomous study plan

MSc Programme in Automation and Control Engineering

Thesis

	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

You can ask to any of your professors for a topic for your thesis.

MSc Programme in Automation and Control Engineering

Further sources of information

www.polinternational.polimi.it

Polinternational

Web-site of the programme

www.ccsatm.polimi.it

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PROGRAMME ~

STUDENTS ~



AUTOMATION AND CONTROL ENGINEERING INDUSTRIA 4.0

EVENTS

BACHELOR DEGREE ~

PHOTO & VIDEO

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USEFUL LINKS

MASTER OF SCIENCE ~



Welcome!