POLITECNICO
MILANO 1863

SCUOLA DI ARCHITETTURA URBANISTICA INGEGNERIA DELLE COSTRUZIONI

SCUOLA DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE

Internal Double Degree
Building and Architectural Engineering and Mechanical Engineering

Call for students enrolled at Politecnico di Milano in Academic Year 2016-17, autumn intake

Table of contents

1. Foreword

In recent years, engineering professions into a global economy are facing innovative challenges that emphasize the demand for modern engineering education offering more transversal skills and technical competencies. These features cannot be offered by a single conventional master degree programme. Starting from 2011 the idea of joint programmes was introduced at Politecnico di Milano and new roadmaps for joint Double Degrees (DD) have been established in order to combine complementary skills and to culturally widen the current degree programmes.

The general objective of this approach is to fully exploit synergies and complementarities among different master degree study plans, to make educational offer more flexible and better matching the dynamics of the industrial world.

POLITECNICO
MILANO 1863

2. Learning objectives

The internal Double Degree in Building and Architectural and Mechanical Engineering aims at capturing the emerging challenges of the construction industry that plays a significant influential role in national and global economies. In particular, such sector is at a turning point, following the economic downturn, in the midst of a new industrial revolutionary cycle. The key principles of Industry 4.0 or fourth industrial revolution – self-directed decision-making, embedded sensor-rich networks and industrial-additive manufacturing – are at early stages in the construction sector but we are closer to a fully implementation. The degree of automation in construction is far less than in other industries, such as manufacturing. This results in poor productivity, poor quality, risky working conditions, higher energy consumptions, higher carbon emissions. In this framework, automation and robotics applications offer great opportunities. These new challenges ask for new professionals able to integrate the typical skills of an architectural engineer with the key technical competencies of a mechanical engineer.

The mission of the Mechanical Engineering Programme is to train professionals with a solid foundational base, a good scientific method and broad technical and applicative knowledge. A mechanical engineer, being involved in the design, optimization and management of products, systems and production processes, must reach a sound preparation in design and testing methodologies, numerical simulation, manufacturing processes, automation and control, material properties and related selection criteria.

The Architectural Engineering course (a track of the Building and Architectural Engineering Programme) prepares high-level professionals that can work in the field of the built environment, and in particular of high-energy performance, low environmental impact buildings, thanks to a multi-disciplinary training and to the acquisition of specialist engineering skills. The track gives students the ability to manage – and take part in – the integrated design process of complex construction projects through theoretical classes and applied design studios.

The integration of the Building and Architectural Engineering and Mechanical Engineering programmes aims to train innovative professionals, with a solid industrial technical background matched with robust skills in the field of construction technologies and design processes, able to manage the challenges of the future construction industry.

3. The study plan

A total of **180 credits over three years** must be gained to obtain the DD in Building and Architectural and Mechanical Engineering. Students will therefore need to select courses in excess with respect to the standard Master of Science programme (120 credits over two years). The applicants have to enrol in the **M.Sc. in Building and Architectural Engineering** or in the **M.Sc. in Mechanical Engineering**, and then present a – formally – individual study programme to extend their career for the third year.

Considering the current study plans of the individual master degree courses and the specific requirements set by the Degree Classes of the Italian Ministry of Education, it is expected that the students coming from one of the two individual study plans would develop a multidisciplinary graduation thesis covering topics that are typical of both the study programmes at the end of the second year and during attendance of the third year.

The overall DD study plan should be considered as a set of accurately **customised tracks** aimed at supplying to a Mechanical Engineer all the fundamental knowledge required for an additional master degree in Architectural Engineering (MEC-BAE study plan) and to an Architectural Engineer those required for an additional master degree in Mechanical Engineering (BAE-MEC study plan). These combined tracks generally adopt pre-existing courses, mainly selected among those offered by the Master degree study plans, in order to supply fundamentals about the second degree.

4. Structure of the study plan

The study plan is developed and specifically customised for Architectural Engineering students wishing to expand their expertise in Mechanical Engineering (BAE-MEC track) and for Mechanical Engineering students with specific interests in Architectural Engineering (MEC-BAE track).

The structure of the study plan is illustrated in detail in the following table. It consists of 57-62 CFU of grounding courses (depending on the student's Bachelor degree), which are followed by a common track consisting of courses taken from both BAE and MEC M.Sc programmes. The third and final year has a strong focus on the development of the final thesis, where the acquired multidisciplinary skills from both Architectural and Mechanical engineering are applied in practice to a joint project work.

POLITECNICO
MILANO 1863

BAE-MEC track

Year 1 – BAE – MEC					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
096588	ING-IND/11	Building Physics	1	9	9
096589	ICAR/09	Structural Design	1	6	6
099798	ICAR/10	Sustainable Multidisciplinary Design Process + studio	1	9	9
096612	ICAR/11	Integrated Project Management and Design Tools	1	6	6
096600	ING-IND/11	Building Services	2	6	6
097626	ICAR/11	Design Optioneering	1	6	12
097625	ICAR/11	Building Durability	2	6	
097619	ICAR/10	Energy Efficient Buildings	2	6	
095844	ING-IND/17	Design and Management of Production Systems	2	10	10
		48 credits BAE + 10 credits MEC			**58**

Year 2 – BAE - MEC					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
095840	ING-IND/16	Advanced manufacturing processes	1	10	10
095837	ING-IND/13 ING-IND/32 ING-INF/04	Control and Actuating Devices for Mechanical Systems	1	9	9
095843	ING-IND/12	Measurements	1	5	5
095838	ING-IND/21	Applied Metallurgy	1	6	6
095842	ING-IND/13	Mechanical System Dynamics	2	5	5
095841	ING-IND/14	Machine Design 2	2	10	10
095839	ING-IND/09	Energy Systems LM	2	7	7
096601	ING-IND/22	Building Materials	2	9	9
		9 credits BAE + 52 credits MEC			**61**

POLITECNICO
MILANO 1863

Year 3 – BAE - MEC					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
099757	ICAR/11	Sustainable Building Technologies + studio (common project work)	1	9+3	18+6
099809	ICAR/14	Architectural Design + studio (common project work)	1	9+3	
051583	ING-IND/13	Robotics and mechatronics	1	8	16
051582	ING-IND/16	Advanced Manufacturing Systems	1	8	
051585	ING-IND/15	Computer-Aided Design and mechanical prototyping	1	8	
051584	ING-IND/14	Lightweight design of smart mechanical systems	1	8	
091506	ING-IND/12	Measuring techniques and sensors for automation B	1	8	
		International workshop on Construction Robotics	2	3	3
		Final Thesis (Integrated Final Design Studio BAE + MEC 17 credits + Internship 3 credits)	1, 2	20	20
					63

MEC-BAE track

Year 1 – MEC-BAE					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
095840	ING-IND/16	Advanced manufacturing processes	1	10	10
095837	ING-IND/13 ING-IND/32 ING-INF/04	Control and Actuating Devices for Mechanical Systems	1	9	9
095843	ING-IND/12	Measurements	1	5	5
095838	ING-IND/21	Applied Metallurgy	1	6	6
095842	ING-IND/13	Mechanical System Dynamics	2	5	5
095841	ING-IND/14	Machine Design 2	2	10	10
095839	ING-IND/09	Energy Systems LM	2	7	7
096601	ING-IND/22	Building Materials	2	9	9
		9 credits BAE + 52 credits MEC			**61**

POLITECNICO
MILANO 1863

Year 2 – MEC-BAE					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
096588	ING-IND/11	Building Physics	1	9	9
096589	ICAR/09	Structural Design	1	6	6
099798	ICAR/10	Sustainable Multidisciplinary Design Process + studio	1	9	9
096612	ICAR/11	Integrated Project Management and Design Tools	1	6	6
096600	ING-IND/11	Building Services	2	6	6
097626	ICAR/11	Design Optioneering	1	6	12
097625	ICAR/11	Building Durability	2	6	
097619	ICAR/10	Energy Efficient Buildings	2	6	
095844	ING-IND/17	Design and Management of Production Systems	2	10	10
		48 credits BAE + 10 credits MEC			**58**

Year 3 – MEC - BAE					
Code	**SSD**	**Course title**	**Semester**	**Credits**	**Credits**
099757	ICAR/11	Sustainable Building Technologies + studio (common project work)	1	9+3	18+6
099809	ICAR/14	Architectural Design + studio (common project work)	1	9+3	
051583	ING-IND/13	Robotics and mechatronics	1	8	16
051582	ING-IND/16	Advanced Manufacturing Systems	1	8	
051585	ING-IND/15	Computer-Aided Design and mechanical prototyping	1	8	
051584	ING-IND/14	Lightweight design of smart mechanical systems	1	8	
091506	ING-IND/12	Measuring techniques and sensors for automation B	1	8	
		International workshop on Construction Robotics	2	3	3
		Final Thesis	1, 2	20	20
					63

POLITECNICO
MILANO 1863

5. Admissions

Applications for the Internal Double Master of Science degree may be submitted by students of Politecnico di Milano **enrolled in Academic Year 2016-17, autumn intake**, either in:

- Master of Science (equivalent to Laurea Magistrale) Programme in **Mechanical Engineering**; or
- Master of Science (equivalent to Laurea Magistrale) Programme in **Building and Architectural Engineering**.

The application should be officially addressed to the Dean's Office of the School of Architecture Urban Planning Construction Engineering, and submitted to the **Protocol Office** of Politecnico di Milano, building 3, basement floor, piazza Leonardo da Vinci 32, Milan. **This is the only officially recognised submission procedure**. Submissions in any other forms will not be valid.

The following information should be provided in the application:

- Motivation letter;
- Final mark in the Bachelor Degree;
- Curriculum Studiorum in the Bachelor (including exams transcripts and abstract of the thesis) and in the Master of Science (exams transcripts, when available) Programmes;
- Curriculum Vitae with clear indication of other competencies developed (beside the curriculum studiorum) and how they were developed, professional experiences, and hobbies.

An evaluation Committee will select the applicants. It will be composed both by professors from the Study course in Building and Architectural Engineering and Mechanical Engineering as selected by the School.

The **deadlines of the selection process** are the following:

- submission of applications to the Protocol Office: by Friday 21st July, 12 noon;
- interview with the evaluation Committee: Monday 24th July, afternoon (more details will be communicated directly to applicants);
- publication of the list of accepted students: Friday 28th July.

Information about the call and its results will be published on the following websites:

- http://www.ccsmecc.polimi.it/
- http://www.ingindinf.polimi.it/didattica/doppie-lauree-interne/
- http://www.ccsbae.polimi.it/
- http://www.auic.polimi.it/en/educational-offer/double-degrees/internal-double-degrees/

POLITECNICO
MILANO 1863

6. Contacts

Contacts for M.Sc. in Architectural Engineering:

- Prof. Gabriele Masera (gabriele.masera@polimi.it)
- Prof. Giuliana Iannaccone (giuliana.iannaccone@polimi.it)

Contacts for M.Sc. in Mechanical Engineering:

- Prof. Francesco Braghin (francesco.braghin@polimi.it)
- Prof. Gaetano Cascini (gaetano.cascini@polimi.it)