POLITECNICO
MILANO 1863

POSTGRADUATE PROGRAMME IN MECHANICAL ENGINEERING

Open Day

www.mecheng.polimi.it

@mechengpolimi

POLITECNICO DI MILANO

Over **1.300** Faculty and
1.200 staff members
and lab technicians

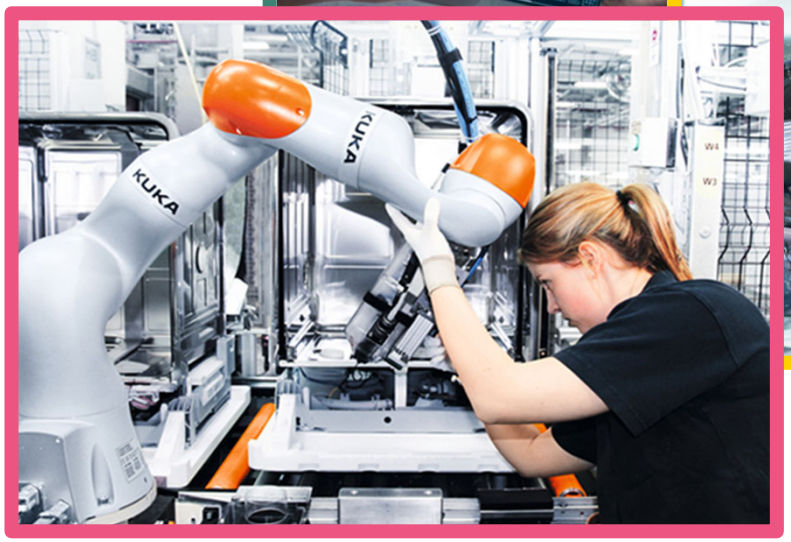
Industrial and Information Engineering
Civil and Environmental Engineering
Architecture
Design

4 Schools

Over **42.000**
students

12
Departments

MECHANICAL ENGINEER, AN EVER-EVOLVING PROFESSION



JOB OPPORTUNITIES WORLD EDITION

Mechanical Design Engineer
APPLE - Santa Clara, CA

Field Service Engineer
NIKON PRECISION EUROPE
Maynooth, Ireland

Sr. Mechanical Engineer
AMAZON - Seattle, WA, US

Controls Manager - Powertrain Calibration and Control
ASTON MARTIN -
Wellesbourne, United Kingdom

Mechanical Engineer (Starlink)
SPACEX - Redmond, WA

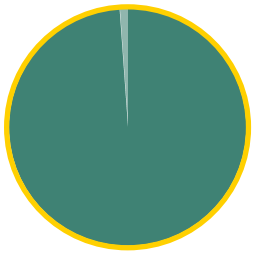
MECHANICAL ENGINEERING PROGRAMME

MECHANICAL ENGINEERING PROGRAMME

WHY ENROLLING IN THE POSTGRADUATE PROGRAMME IN MECHANICAL ENGINEERING?

EMPLOYMENT STATISTICS
MASTER OF SCIENCE IN MECHANICAL ENGINEERING AT POLITECNICO DI MILANO

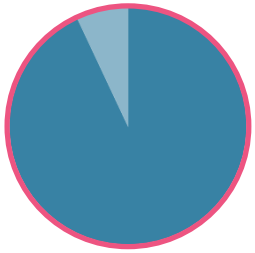
EMPLOYMENT RATE*



98%

* 1 year after graduation, except Ph.D. students

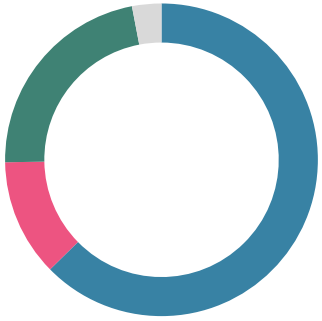
EMPLOYMED WITHIN 6 MONTH*



88%

* Percentage calculated on graduates employed within a year

TYPE OF CONTRACT*



Permanent contract	68%
Fixed-term contract	13%
Apprenticeship	15%
Internship	2%
Other*	2%

* Project-based / Occasional collaboration

TOP 5 INDUSTRIES

Automotive	24%
Mechanics and Installation	18%
Metallurgy and Metalworking	7%
Electronics and Automation	7%
Aerospace and Aeronautics	5%

NET MONTHLY INCOME

€ 1.708

QS WORLD UNIVERSITY RANKINGS 2022

AMONG THE TOP UNIVERSITIES AROUND THE GLOBE, POLITECNICO DI MILANO RANKS:

- **1ST IN ITALY;**
- **6TH IN EUROPE**
- **13TH IN THE WORLD.**

IN **MECHANICAL ENGINEERING**.

ALSO IN THE TOP 10:

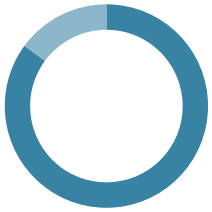
MIT, STANFORD UNIVERSITY, HARVARD UNIVERSITY, UNIVERSITY OF CALIFORNIA AT BERKELEY, NANYANG TECHNOLOGICAL UNIVERSITY, NATIONAL UNIVERSITY OF SINGAPORE, UNIVERSITY OF MICHIGAN- ANN ARBOR

#RANK 2022	UNIVERSITY	LOCATION EUROPE
3	UNIVERSITY OF CAMBIRDGE	UK
5	DELFT UNIVERSITY OF TECHNOLOGY	NL
8	ETH ZURICH	UK
10	IMPERIAL COLLEGE LONDON	UK
12	UNIVERSITY OF OXFORD	UK
13	**POLITECNICO DI MILANO**	**IT**
19	RWTH – AACHEN UNIVERSITY	DE

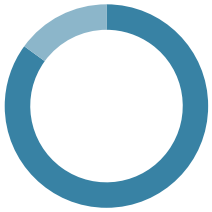
QS WORLD UNIVERSITY RANKINGS

RANKING CRITERIA

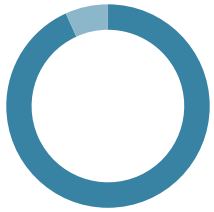
OVERVIEW



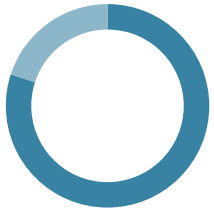
88,9%
Overall



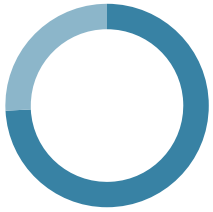
89,8%
Academic Reputation



95,4%
Employer Reputation



82,0%
H-index Citations

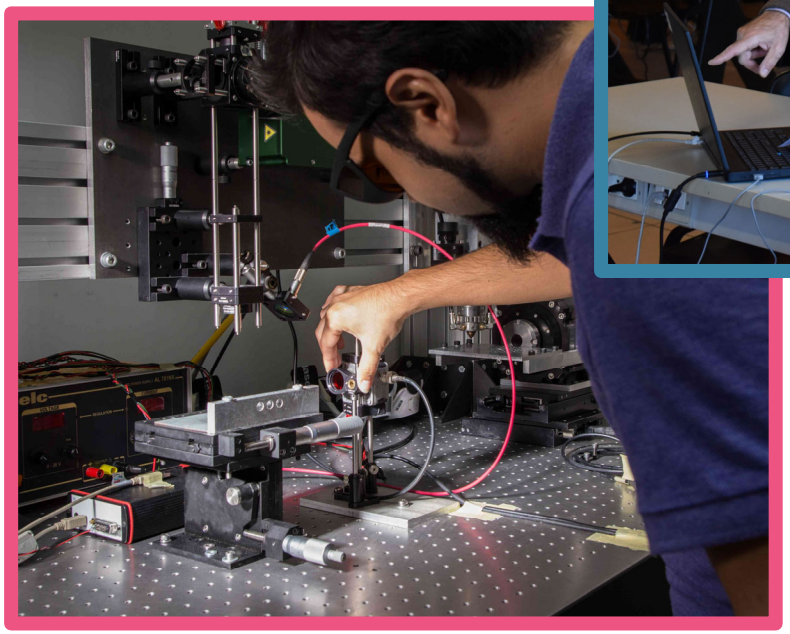


80,4%
Citations per Paper

EMPLOYER REPUTATION – GLOBAL RANKING

#RANK 2021	UNIVERSITY	EMP. REPU.	LOCATION EUROPE
3	UNIVERSITY OF CAMBIRDGE	97.3	UK
4	UNIVERSITY OF OXFORD	97.0	UK
7	**POLITECNICO DI MILANO**	**95.4**	**IT**
9	DELFT UNIVERSITY OF TECHNOLOGY	93.5	NL
10	ETH ZURICH	93.1	CH
13	IMPERIAL COLLEGE LONDON	90.8	UK

STUDYING MECHANICAL ENGINEERING



BACHELOR OF SCIENCE

Milano Bovisa,
Piacenza

3 years
180 ECTS

Language:
Italian

TOL –
Admission test

Internship and entrance into
the labour market

Admission to the Master of
Science

MASTER OF SCIENCE

Milano Bovisa,
Lecco, Piacenza

2 years
120 ECTS

Language:
English

Application evaluation
Self-assessment test

Entrance into the labour
market

Admission to the Ph.D.
Programme

PH.D.

Milano Bovisa,
Lecco, Piacenza

3 years

Language:
English

Call for applications

Entrance into the labour
market

Entrance into the academic
career

MECHANICAL ENGINEERING PROGRAMME

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

PROGRMME STRUCTURE 120 ECTS

YEAR I

40 ECTS core courses
(different among the various tracks)

10 ECTS track specific course(s)
(eventually to choose from small basket)

10 ECTS track specific course(s)
(eventually to choose from small basket)
or
5 ECTS core course
(eventually to choose from small basket)
+
5 ECTS track specific course
(eventually to choose from small basket)

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

PROGRMME STRUCTURE 120 ECTS

YEAR II

10-15 ECTS track specific course(s) (eventually to choose from small basket)
15-20 ECTS elective courses (to choose from big basket)
5 ECTS lab course (to choose from small basket
5 ECTS open course (to choose from any POLIMI, A4TECH, IdeaLeague course)
20 ECTS master thesis

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

TRACKS

Core Mechanical Competences

CM1 – Digital Technologies for Product Development

CM2 – Materials Design and Processing for Industrial Engineering

CM3 – Computational Mechanical Design

CM4 – Green Design and Sustainable Manufacturing
Additive Manufacturing

CM5 – Production Systems

CM6 – Data Science for Industrial Engineering (*with Mathematical Engineering*)

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

TRACKS

Core Mechanical Applications

FA1 – Automotive and Motorsport Engineering
- *Science and Technology*
- *Aerodynamics*
- *Noise and Vibration*

FA2 – Marine Engineering

FA3 – Railway Engineering

FA4 – Mechatronics and Robotics
- *Control Systems*
- *Mechatronic Systems*
- *Robotics*

FA5 – Mechatronics for Manufacturing (@ PC, focus on companies)

FA6 – Smart and Sustainable Industry (@ LC, focus on labs)

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

TRACKS

Cross-cutting Applications

CC1 – Propulsion and Power(*with Energy Engineering*)

CC2 – Wind Energy (*joint with Energy Engineering*)

CC3 – Defense and Security (*with Computer Science and Engineering*)

CC4 – Bioinspired Engineering (*with Chemical Engineering*)

CC5 – Micro e Nano Systems (*joint with Materials Engineering and Nanotechnology and Engineering Physics*)

CC6 – Sports Engineering (*with Biomedical Engineering* - @ LC, focus on labs)

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM1 – Digital Technologies for Product Development

(ref. Prof. Giandomenico Caruso)

The track Digital Technologies for Product Development aims to train students with a **systemic approach oriented to industrial product development**.

Students will be able to **proficiently use the enabling digital technologies of Industry 4.0 and 5.0 for information management, modelling, visualisation, and simulation**.

The track courses include design and laboratory activities with a fundamental educational role. The widely-used **"learning by doing" approach** will provide students with practical experimenting of methodologies and tools guided by teachers and tutors.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM1 – Digital Technologies for Product Development

COURSE TITLE	SEM	ECTS
Digital Design Methods	**1**	**10**
Product Digital Twin	**1**	**5**
XR Applications for Engineering	**1**	**5**
Reverse Engineering and Surface Modelling	2	10
Design And Analysis Of Experiments And Response Surface Methodology	2	10
Advanced Manufacturing Processes B	1	5
Advanced machine design	2	10
Lab Course (Haptics and Multisensory Interaction in Extended Reality, Human Modelling In Engineering, Virtual And Physical Prototyping)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM2 – Materials Design and Processing for Industrial Engineering

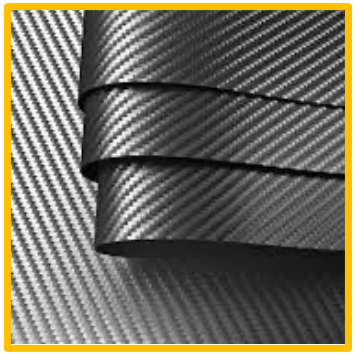
(ref. Prof.ssa Silvia Barella)

Materials are the bases of industrial engineering, leading to revolutions not only of products and processes but of the entire society.

The **design of new materials** for ever more performing applications is required.

Moreover, **sustainability is fundamental** for the planet safeguarding and new challenges await mechanical engineers in industrial fields.

The study of **recycling, zero emission processes, and circular economy** are the basis for new materials development.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM2 – Materials Design and Processing for Industrial Engineering

COURSE TITLE	SEM	ECTS
Materials engineering recycling and environmental impact A	**2**	**10**
Innovation in Materials and Products Production	**1**	**10**
Energy efficiency and decarbonization of industrial processes	1	5
Additive Manufacturing	1	5
Metodi sperimentali per la diagnostica strutturale	1	5
Sustainable materials for innovative processes	2	5
Modelling of Mechanical Behaviour of Materials	1	5
Solidification and welding metallurgy	2	5
Lab Course (Robotic Manufacturing, Materials Selection and Life Cycle Analysis)	**1-2**	**5**

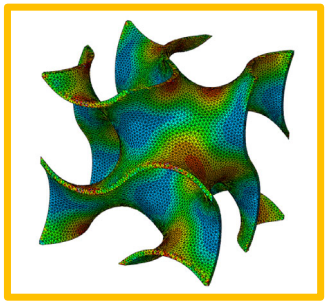
MASTER OF SCIENCE IN MECHANICAL ENGINEERING

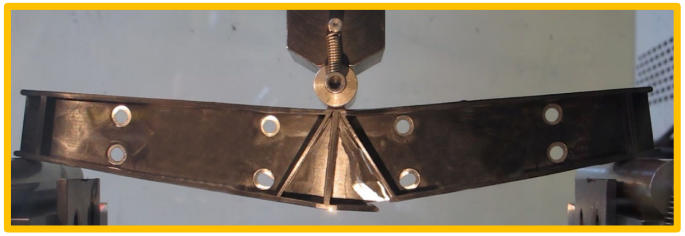
CM3 – Computational Mechanical Design

(ref. Prof. Stefano Beretta)

The Computational Mechanical Design track is aimed at providing students with new tools & skills for the **computational and digital approaches for design of advanced mechanical components**.

Core competences will be **topology optimization** together with additive manufacturing to obtain disruptive design solutions, **multi-physics approaches** for accurate multi-material solutions and **digital-twins**.





MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM3 – Computational Mechanical Design

COURSE TITLE	SEM	ECTS
Mechanical Behaviour of Materials & Finite Element Simulation	1	10
Computational Fluid Dynamics	**2**	**5**
Machine Learning and Model Identification for Mechanical Systems	2	5
Digital Twin for Health and Usage Monitoring	1	5
Topology Optimisation	1	5
Measurements for Mechanical Engineering	2	5
Surface modelling for engineering applications	2	5
Additive Manufacturing B	1	5
Simulation tools for materials and processes	1	5
Lab Course (Metamaterials and Metastructures, Prototyping of Bioinspired Solutions, Structural Health and Usage Monitoring in Action, …)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

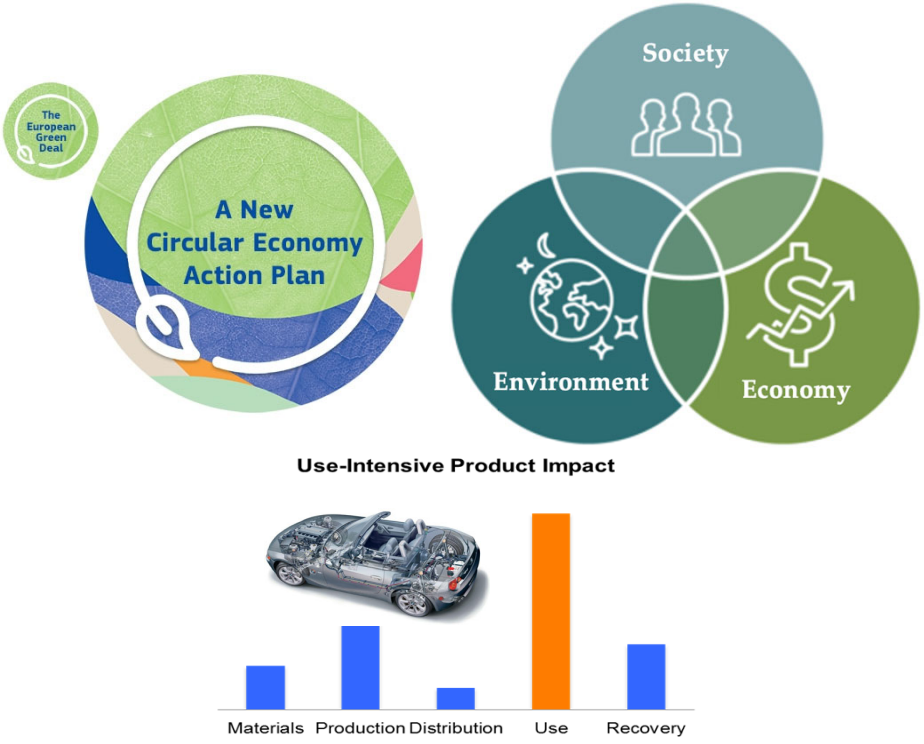
CM4 – Green Design and Sustainable Manufacturing

(ref. Prof.ssa Bianca Colosimo, Prof. Mario Guagliano, Prof. Michele Monno)

The 2030 Agenda for Sustainable Development and the European Green Deal define a path for the future perspective of the planet and its inhabitants, which has become particularly **topical in light of the main emergencies** (social, energetic and environmental).

One fundamental factor in these ambitious targets is the paradigm shift in product design and industrial production, to foster the transition to a **new generation of green products and circular and sustainable manufacturing.**

Aim of this track is the education and training of a new generation of professionals, **with skills rooted in mechanical and industrial engineering** and **specialized in sustainable development and digitization**, which are rapidly becoming a priority of industrial companies.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM4 – Green Design and Sustainable Manufacturing

COURSE TITLE	SEM	ECTS
Methods and tools for Circular Mechanical Design	**2**	**10**
Manufacturing and De-manufacturing Systems Engineering	**1**	**10**
Digital Machining A	1	10
Lightweight Design of Mechanical Structures	1	10
Additive Manufacturing A	1	10
Materials Engineering, Recycling and Environmental Impact A	2	10
Lab Course (Additive Manufacturing for the Green Transition, Product Design for Life Cycle Analysis Assessment, Digital Machining, Re-Manufacturing, Robotic Manufacturing)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM5 – Production Systems

(ref. Prof. Enrico Cagno, Prof. Andrea Matta)

The Mechanical Engineer with the study plan in Production Systems is a professional with advanced knowledge and skills in the **design, management, and control of industrial production systems**.

Students will learn how to **model and optimize production processes, use automation and robotics in production systems, and apply advanced techniques for managing and controlling industrial processes and systems**.

Learning and **hands-on experiencing**, in specific laboratory activities, on the impact of digitalization and how to implement digital technologies.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM5 – Production Systems

COURSE TITLE	SEM	ECTS
Manufacturing Systems Engineering	**1**	**10**
Advanced Project Management	**2**	**10**
Design and Analysis of Experiments and Response Surface Methodology	**2**	**10**
Industrial Plants A	**2**	**10**
Digital Twins of Production Systems	1	10
Smart Management and Industrial Asset Management	1	10
Logistics Management	2	10
Quality Data Analysis	2	10
Lab Course (Data Analytics for Process Improvement, Digital Production Systems)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM6 – Data Science for Industrial Engineering

(ref. Prof.ssa Bianca Colosimo)

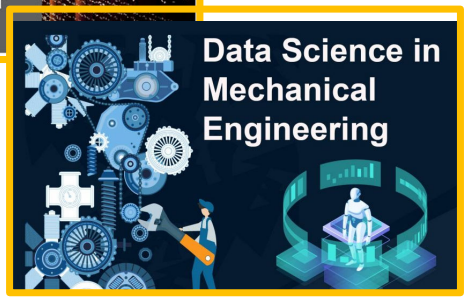
The track trains students with a **solid knowledge** of the most **advanced tools** and **methodologies** for **data science** to augment their vertical knowledge on engineering problem domains.

The final goal is to enhance students' skills in **problem setting** and **problem solving** in complex challenges.

The track includes courses focusing on **data acquisition** and **modelling**, **artificial intelligence** and **statistical learning** with courses focusing on **product design**, **process** and **product improvement**, **manufacturing** and **maintenance**.

We foster a multidisciplinary class with students of **mathematical** and **mechanical** engineering.

In the final laboratory, students will **enjoy** an **interdisciplinary hands-on experience** on data exploration and analysis for **real problem solving**.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CM6 – Data Science for Industrial Engineering

COURSE TITLE	SEM	ECTS
Design and Analysis of Experiments & Response Surface Methodology	2	**10**
Applied Statistics	2	**10**
Machine Learning and Model Identification for Mech Systems	2	5
Digital Twin for Health and Usage Monitoring	2	5
Edge-Device Based Measurements and Ind IoT	2	5
Vision Based 3D Measurements	2	5
Lab Course (Data Science for Industrial Engineering)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA1 – Automotive and Motorsport Engineering

(ref. Prof. Massimiliano Gobbi, Prof. Stefano Melzi)

Students will learn how to **design both vehicle components and the vehicle as a whole.**

Knowledge of **manufacturing processes, typical of the automotive sector,** can be acquired.

Motorsport applications will be taught as well.

Graduates will be able to **conceive, design, construct, and test an automotive system**.

They will acquire the technical skills required by either Automotive Suppliers or Car Makers.

Faculty and industry partners focus on providing students with **hands-on experience**.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA1 – Automotive and Motorsport Engineering

COURSE TITLE	SEM	ECTS
Vehicle Dynamics and Control A	**2**	**10**
Ground Vehicle Engineering	**1**	**10**
Internal Combustion Engines for Automotive Applications	2	5
Aerodynamics of Transport Vehicles	1	5
Connected and Autonomous Vehicles	1	5
Hybrid And Electric Vehicles	1	5
Advanced Motorsport Engineering	2	5
Vehicle Design (Optimal Design)	1	5
Design and Construction of Automotive Electric Motors	1	5
Lab Course (Human-in-the-loop Dynamic Driving Simulator, Formula Student, Motostudent, …)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA2 – Marine Engineering

(ref, Prof. Paolo Schito)

The marine environment presents enormous possibilities for development, the so-called **blue economy**. However, it is also an ecosystem that regulates global climate and a reservoir of biodiversity. Responsible development of the blue economy requires both **technical expertise and understanding of the ocean environment**.

The marine engineering track covers a wide range of engineering subjects relevant to the **development and procurement of marine engineering**.

These competences include knowledge of the physical challenges in constructing **offshore installations**, developing technologies for both **surface and underwater systems** as well as modelling interactions with the **natural marine environment**.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA2 – Marine Engineering

COURSE TITLE	SEM	ECTS
Naval Hydrostatics And Hydrodynamics	**2**	**10**
Ship Structural Analysis And Design	**2**	**10**
Marine Propulsion Technology	2	5
Ship Design And Project Management	1	5
Ocean And Coastal Engineering	1	5
Advanced Techniques For Vibro Acoustic Measurements	1	5
Surface Modeling for Engineering Applications	2	5
Materials for Sustainable Transportation Systems	1	5
Lab Course (Physis PEB, Wind Energy, …)	**1-2**	**5**

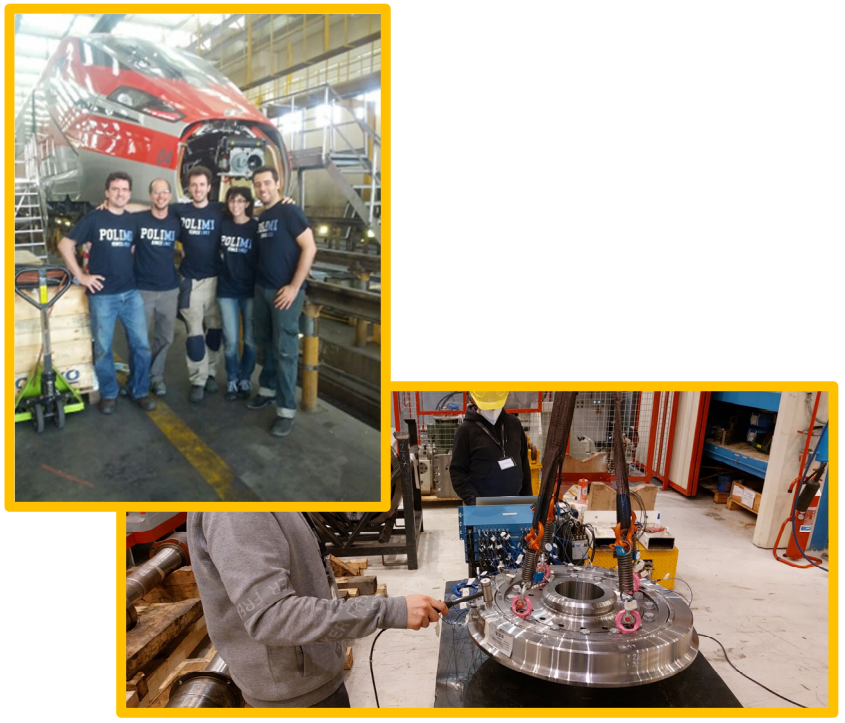
MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA3 – Railway Engineering

(ref. Prof. Stefano Bruni)

The Railway Engineering track provides the student with a **systemic approach to railways** encompassing subjects traditionally related to mechanical engineering such as ***vehicle design***, ***vehicle dynamics***, ***lightweight materials***, ***automation and control systems***, together with topics from other areas of engineering such as ***electrical systems***, ***railway tracks***, ***signalling and communication***, ***transportation planning***, ***asset management***.

The track also looks at **future/disruptive changes in railway transportation** such as MAGLEV and Hyperloop.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA3 – Railway Engineering

COURSE TITLE	SEM	ECTS
Rail Vehicle Dynamics and Train-Track Interaction	**2**	**10**
Railway Vehicle Design	**1**	**10**
Electrical Systems for Railway Transportation	**2**	**10**
Traffic Engineering & Control	1	5
Signalling and Control in Railway Systems	1	5
Railway Track Engineering	2	5
Vehicle Acoustics	1	5
Lab Course (Railway Engineering, …)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

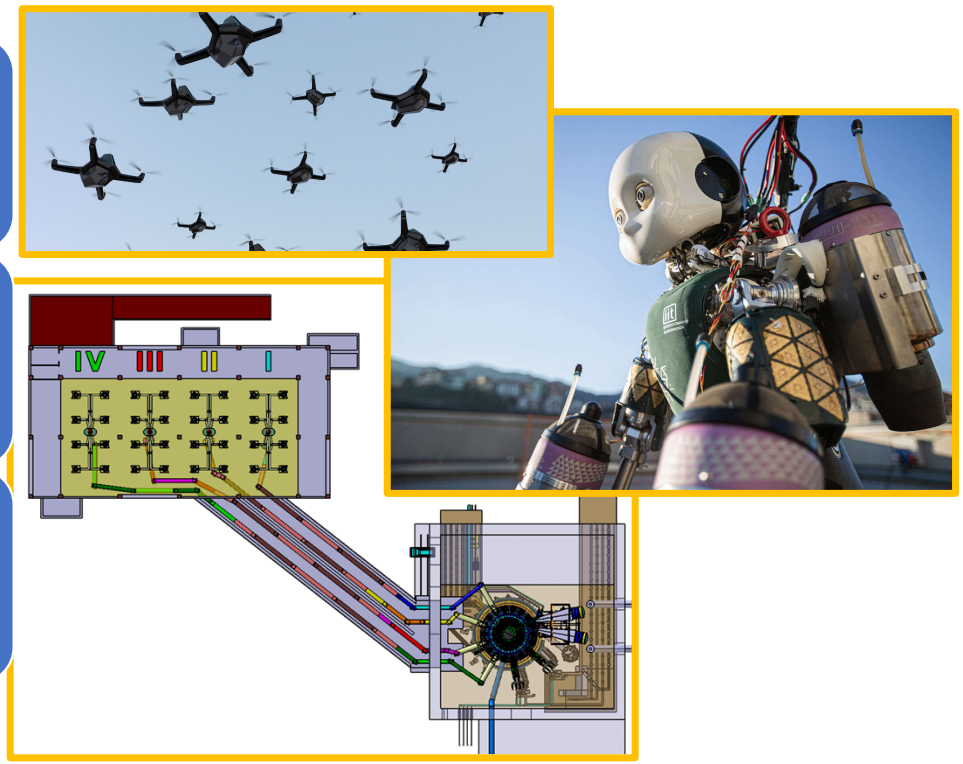
FA4 – Mechatronics and Robotics

(ref. Prof. Francesco Braghin)

Creating mechatronic systems requires **skills from a broad range of subjects**. Consider modern passenger cars and intelligent robots for households and industry. These complex and highly interactive systems pose fundamental questions about their design, physical modeling, optimization and control.

The Mechatronics and Robotics track offers students the **integrated and multidisciplinary engineering expertise** needed to design, develop and manage innovative and intelligent high-tech products and systems.

The track also offers **course packages** focused on specific subtopics, i.e. control, mechatronics and robotics.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA4 – Mechatronics and Robotics

COURSE TITLE	SEM	ECTS
Methods and Technologies for Feedback Control Systems	**2**	**10**
Mechatronic Systems A	**1**	**10**
Bio-inspired Robotics	2	10
Collaborative Robotics	1	5
Micro and Nano Robotics	1	5
Design of Robotic Systems	1	5
Soft Robotics	2	5
Swarm Robotics	1	5
Lab Course (Innovative Applications of Industrial Robotics, Mechatronics, Mechanical Engineering Applications of Deep Learning, …)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

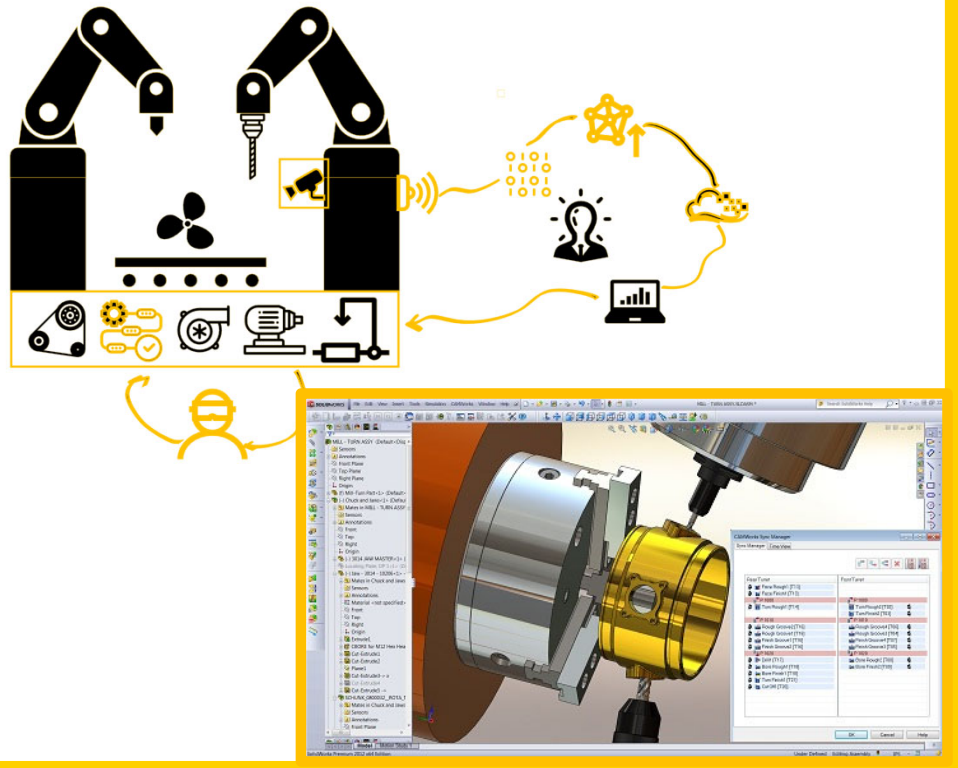
FA5 – Mechatronics for Manufacturing @ PC

(ref. Prof. Paolo Albertelli)

To survive in a fast-changing world, manufacturers must become **quicker, smarter, and greener**.

The **Mechatronics for Manufacturing** track covers the broad field of **mechatronics** related to **manufacturing processes and systems**, highlighting Research and Developments in the modern engineering of advanced mechatronics, digital and manufacturing technology.

The courses will report **meaningful examples from broad industrial applications** and **companies will be actively involved in the teaching process**.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA5 – Mechatronics for Manufacturing @ PC

COURSE TITLE	SEM	ECTS
Advanced Feedback Control Design	**2**	**10**
Mechatronics for Sustainable Manufacturing	**2**	**10**
Robotics for Manufacturing	**1**	**10**
Computational Fluid Dynamics for Manufacturing Processes	1	5
Vision Based Measuring Systems for Engineering	1	5
Precision Machine Design	1	5
XR Applications for Engineering	1	5
Cyber-Physical Manufacturing Systems	1	5
Lab Course (Machinery Mechatronic Design, …)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA6 – Smart and Sustainable Industry @ LC

(ref. Prof. Marco Tarabini)

The track prepares highly qualified mechanical engineers for developing **solutions in the fields of industry 4.0, efficient manufacturing processes and sustainable components' production**.

The courses have a strong **focus on hands-on learning and experimentation**, to improve the students' practical knowledge used in the most advanced fields of Mechanical Engineering.

Exams will be based on **projects and laboratory works**.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

FA6 – Smart and Sustainable Industry @ LC

COURSE TITLE	SEM	ECTS
Vision Based 3D Measurements LC	1	5
Collaborative Robotics	1	5
Lightweight Design of Mechanical Systems	1	5
Computer Aided Design and Mechanical Prototyping	2	10
Finite Element Method based Optimization of Manufacturing Processes	1	5
Logistics Management LC	1	5
Laboratory of Materials and Damage Analysis	1	10
Technologies for Artificial Intelligence	1	5

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC1 – Propulsion and Power

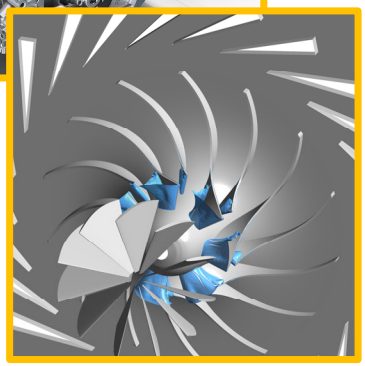
(ref. Prof. Paolo Gaetani)

This track trains mechanical engineers with in-depth knowledge of the operating principles of machines for the propulsion, generation and use of mechanical power.

It guides them in the development and autonomous management of engineering projects involving the problems of sizing, design, choice and use of these components.

The focus is on the devices for propulsion and for generation and use of mechanical power, in the contest of the energy transition and decarbonization.

Students will gain expertise on fluid dynamics, on the energy and environmental sustainability of engines and power generation and usage devices, modeling and innovative solutions, energy and mechanical solutions.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC1 – Propulsion and Power

COURSE TITLE	SEM	ECTS
Internal combustion engines	**2**	**10**
Turbomachinery	**1**	**10**
Computational Fluid Dynamics	2	10
Advanced Measurement Techniques for Propulsion and Power	2	10
Rotordynamics and Diagnostics A	1	10
Finite Element Simulation for High Temperature Engineering Applications	1	10
Technologies for Artificial Intelligence	1	5
Lab Course (Internal Combustion Engines: Design and Testing, Turbomachinery: Design and Testing, Physis PEB)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC2 – Wind Energy

(ref. Prof. Marco Belloli)

Wind energy is a leading source of clean power and represents a solid response to the growing global demand for energy services

POLIMI is active in **research** and has strong collaborations with **industries** in this sector

The **Wind Energy Track** provides students with fundamental tools needed to make power from wind

Knowledge in the main disciplines involved in wind energy: aerodynamics and fluid mechanics, materials, control systems, electric conversion, operation, and maintenance

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC2 – Wind Energy

COURSE TITLE	SEM	ECTS
Design of Fluid Machines for Green Power Generation	**1**	**10**
Wind Turbine and Wind Farm Modelling and Control	**2**	**10**
Wind Farm O&M	2	5
Resource Analysis and Atmospheric Boundary Layer	2	5
Advanced Computational Fluid Dynamics	2	5
Lab Course (Turbomachinery: Design and Testing, Wind Energy, Structural Health and Usage Monitoring in Action)	**1-2**	**5**

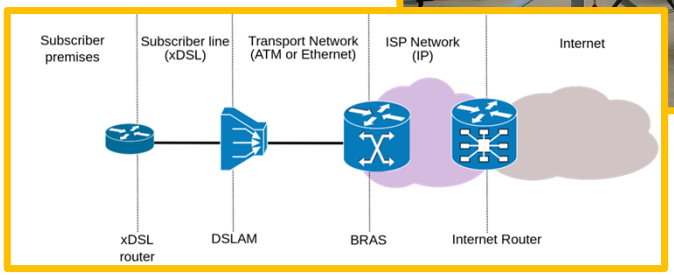
MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC3 – Defense and Security

(ref. Prof. Marco Boniardi)

Il percorso “Difesa & Sicurezza” si propone di combinare competenze tecnico-ingegneristiche consolidate (materiali, tecnologie, progettazione, sistemi, controlli, project managemanet, informatica, ecc.) con tematiche non-tradizionali e poco trattate in ambito universitario, quali la balistica, l’esplosivistica, la geopolitica, la cybersicurezza e gli attacchi informatici, la vulnerabilità dei sistemi, i veicoli a guida autonoma, la gestione del rischio.

La prospettiva degli insegnamenti vuole essere ap-plicativa e di immediata spendibilità per il mercato del lavoro



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC3 – Defense and Security

COURSE TITLE	SEM	ECTS
Fondamenti di balistica ed esplosivistica	**2**	**10**
Software Engineering	**2**	**5**
Technologies for Information Systems	**2**	**5**
Digital Technology	**2**	**5**
Unmanned Vehicles (Surface, Subsurface, Aerial)	1	5
Impact Engineering	1	5
Design and Analysis of Experiments	2	5
Lab Course (Balistica forense, Artificial Intelligence for Security)	**1-2**	**5**

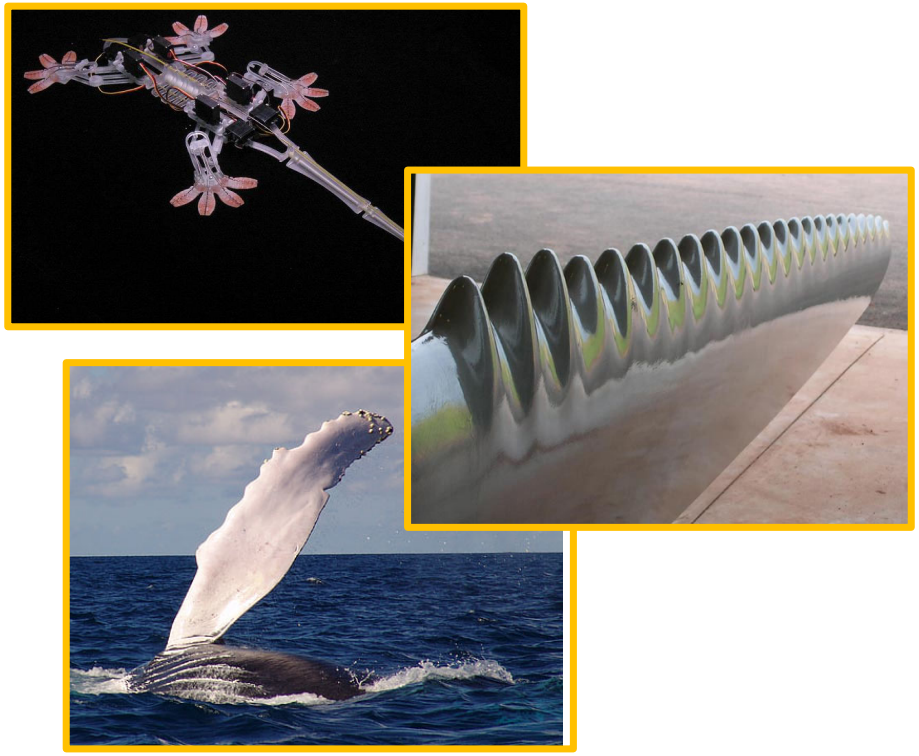
MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC4 – Bioinspired Engineering

(ref. Prof. Gaetano Cascini, Prof. Simone Cinquemani)

Nature has long been recognized as a source of efficient solutions and strategies adopted by living organisms for survival and biological evolution, and these strategies have proven to be consolidated and refined over thousands of years during the succession of generations.

The bioinspired engineering track offers **interdisciplinary, advanced design competencies and critical thinking skills**, exploiting the lessons learned from nature and showing how this knowledge can lead to **more creative and sustainable engineering solutions**.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC4 – Bioinspired Engineering

COURSE TITLE	SEM	ECTS
Bio-inspired Design and Robotics	**2**	**10**
Instrumentation and Measurements for Bionic Systems	1	5
Soft Robotics	2	5
Biomimetic Structure Design	1	5
Additive Manufacturing B	1	5
Smart Materials	2	5
Lab Course (Bioinspired Robotics, Prototyping of Bioinspired Solutions)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC5 – Micro e Nano Systems

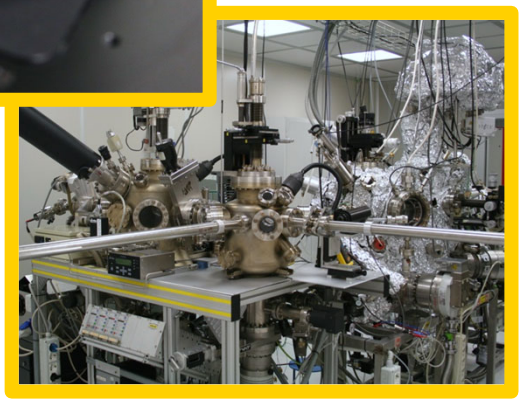
(ref. Prof. Francesco Braghin)

Products and systems we deal with on a daily basis are becoming increasingly complex and smart. Think of the automobile industry, robotic applications, medical services, artificial intelligence, communications and the energy sector.

The track in Micro and Nano Engineering offers a top-level, future-oriented, multidisciplinary education that builds upon the fundamentals of traditional science and engineering, from physics to materials science, from mechanical to electronic engineering.

The goal of the program is to provide foundations for exploring and developing future technologies through research in materials, processes, design methods, and technologies for micro- and nano-scaled systems.

The master's thesis will be developed making use of microfabrication and other experimental facilities of Polifab, the micro and nano technology center of Politecnico di Milano.



MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC5 – Micro e Nano Systems

COURSE TITLE	SEM	ECTS
Nonlinear Dynamics and Chaos	**2**	**5**
Fundamentals of Electronics	**2**	**10**
Elements of Modern Physics	**1**	**10**
Micro and Nano Robotics	**1**	**5**
Nanoelectronics of Graphene and Related 2D Materials	1	5
Physics of Semiconductors	1	5
Multi-Physics Modelling and Simulation	1	5
Lab Course (Multi-Disciplinary Design Laboratory @ POLIFAB)	**1-2**	**5**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC6 – Sports Engineering @ LC

(ref. Prof. Marco Tarabini)

In the Sports Engineering track, students will apply the principles of engineering to design, develop, and improve sports equipment and facilities, as well as to use data to optimize the sport performance and the teams' strategy.

Courses will be a mix of lectures and laboratory projects, with a strong focus on hands-on learning and experimentation. The approach will improve the students' practical knowledge with the tools, techniques, and equipment used in the Sports Engineering field, as well as their problem-solving skills and critical thinking abilities.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

CC6 – Sports Engineering

COURSE TITLE	SEM	ECTS
Data Analysis for Mechanical Systems	1	10
Machine Dynamics	1	5
Materials for Sport and Rehabilitation	1	5
Sports Physiology for Engineering	1	10
Machine Design and Construction	2	10
Manufacturing and De-manufacturing of Sport Equipment	2	5
Sports Biomechanics and Evaluation of Human Performance	2	10

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

INTERNAL DOUBLE DEGREE PROGRAMMES

- Mechanical and Materials Engineering and Nanotechnology
- Biomedical and Mechanical Engineering

EXCHANGE PROGRAMMES

STUDENT MOBILITY

IDEA LEAGUE

PARTNERS: **CHALMERS**, **ETH ZURICH**, **RWTH**, **TU DELFT**

ALLIANCE 4 TECH

PARTENERS: **CENTRALE SUPÉLEC**, **TU BERLIN**, **UNIVERSITY COLLEGE LONDON**

ENHANCE

PARTNERS: **CHALMERS**, **NTNU**, **RWTH**, **TU BERLIN**, **UNIVERSITAT POLITÈCNICA DE VALÈNCIA**, **WARSAW UNIVERSITY OF TECHNOLOGY**

EXCHANGE PROGRAMMES

STUDENT MOBILITY – GLOBAL PARNERSHIPS

- ERASMUS+
- UNITECH
- MEDes
- PEGASUS NETWORK
- T.I.M.E.
- ASEA-UNINET NETWORK
- EXTRA EU PROJECTS
- SINO-ITALIAN CAMPUS
- MCI – MOBILITY CONFAP ITALY
- ERASMUS+ (ICM)
- MAGALHEAS NETWORK
- PLOTONG – DOUBLE DEGREE PROGRAMME
- EIT Manufacturing, EIT Urban Mobility

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