

**Study Plan Master's Degree Program  
LM-33 MECHATRONICS AND SMART TECHNOLOGY ENGINEERING (a.y. 2024-25)**

(enrolled a.y. 2024-25)

Curriculum: **MECHATRONICS**

**FIRST YEAR**

Number		Course	Code	Credits	Area	Taught	Period	Professor
1	X	Sustainable Energy	161003-M1	9	ING-IND/09	ENG	1	Silvia Ravelli
2,1	X	Virtual and Physical Prototyping + Advanced Machine Design (module VPP)	161001	6	ING-IND/15	ENG	1	Daniele Regazzoni Daniele Landi
3	X	Smart sensors and electronic systems	39168-ENG	9	ING-INF/01	ENG	1	Valerio Re Gianluca Traversi
4	X	Functional design and dynamic modeling of mechanical systems	39219	12	ING-IND/13	ENG	1	Paolo Righettini
	X	Power drive systems for mechanical machinery and vehicles			ING-IND/13	ENG	2	Bruno Zappa
5	X	Mechanical vibrations	39074-ENG	6	ING-IND/13	ENG	2	Paolo Righettini
6	X	Fundamental of control systems	161018	6	ING-INF/04	ENG	2	to be defined
	*	Control system technology	21065-ENG	6	ING-INF/04	ENG	2	to be defined
2,2	X	Virtual and Physical Prototyping + Advanced Machine Design (module AMD)	161001	6	ING-IND/14	ENG	2	Sergio Baragetti
7		Trasmissione del calore	39021	6	ING-IND/10	ITA	1	Gianpietro Cossali
		Meccanica dei robot	39051		ING-IND/13	ITA	1	Bruno Zappa
		IT architecture in production	39187-ENG		ING-IND/13	ENG	2	Oliver Riedel
		Laboratorio di elettronica (3 CFU) + Functional design of mechatronic systems (3 CFU)	161019		ING-INF/01 ING-IND/13	ITA-ENG	1+2	Luigi Gaioni to be defined
		Progettazione FEM	39056		ING-IND/14	ITA	2	Sergio Baragetti
		Innovazione di prodotto e di processo (6 CFU)	39218		ING-IND/15	ITA	1	Davide Russo
		Industrial plant design and simulation	161005		ING-IND/17	ENG	2	Chiara Cimini

(\*) : Only for students who have taken a course in Fundamental of control systems in the Bachelor's degree program

60

**SECOND YEAR**

Number		Course	Code	Credits	Area	Taught	Period	Professor
8	X	Mechatronic systems and advanced robotic applications	161026	6	ING-IND/13	ENG	1	Paolo Righettini
9	X	Advanced manufacturing technologies	161007	6	ING-IND/16	ENG	1	Gianluca D'Urso
10		Electric energy conversion and management	161014	6	ING-IND/32	ENG	1	Paolo Giangrande
		Sensori	38058		ING-INF/01	ITA	1	Gianluca Traversi
		Laboratorio di elettronica (3 CFU) + Sensors (3 CFU)	161020		ING-INF/01	ITA-ENG	1	Luigi Gaioni Gianluca Traversi
		Collaborative robotics (3 CFU) + Laboratory Sustainable Industrial Systems SIS (3 CFU)	161021		ING-INF/04	ENG	1+2	Manuel Giuseppe Catalano Matteo Scandella
		Controlli automatici	39067		ING-INF/04	ITA	1	Fabio Previdi
		Robotica	39068		ING-INF/05	ITA	1	Davide Brugali

Curriculum: **SMART TECHNOLOGY ENGINEERING**

**FIRST YEAR**

Number		Course	Code	Credits	Area	Taught	Period	Professor
1,1	X	Sustainable Energy + Thermal Physics for advanced technology (module SE)	161003	9	ING-IND/09	ENG	1	Silvia Ravelli
1,2	X	Sustainable Energy + Thermal Physics for advanced technology (module TP)	161003	6	ING-IND/10	ENG	1	Simona Tonini
2,1	X	Virtual and Physical Prototyping + Advanced Machine Design (module VPP)	161001	6	ING-IND/15	ENG	1	Daniele Regazzoni Daniele Landi
3	X	Smart sensors and electronic systems	39168-ENG	9	ING-INF/01	ENG	1	Valerio Re Gianluca Traversi
2,2	X	Virtual and Physical Prototyping + Advanced Machine Design (module AMD)	161001	6	ING-IND/14	ENG	2	Sergio Baragetti
4	X	Industrial plant design and simulation	161005	6	ING-IND/17	ENG	2	Chiara Cimini
5	X	Materials for advanced engineering applications	39171-ENG	6	ING-IND/22	ENG	2	Sergio Lorenzi
6	X	Data science and automation	39170-ENG	6	ING-INF/04	ENG	2	Davide Previtali
7	X	Mechanical vibrations	39074-ENG	6	ING-IND/13	ENG	2	Paolo Righettini

60

3

**SECOND YEAR**

Number		Course	Code	Credits	Area	Taught	Period	Professor
8	X	Advanced manufacturing technologies	161007	6	ING-IND/16	ENG	1	Gianluca D'Urso
9		Lab course 1 (6 CFU)		6				
		Collaborative robotics (3 CFU) + Robots and automatic machinery for industrial applications (3 CFU)	161022		ING-INF/04 ING-IND/13	ENG	1	Manuel Giuseppe Catalano Paolo Righettini
		Laboratorio di elettronica (3 CFU) + Sensors (3 CFU)	161020		ING-INF/01	ITA-ENG	1	Luigi Gaioni Gianluca Traversi
		IT architecture in production	39187-ENG		ING-IND/13	ENG	2	Oliver Riedel
		Electric energy conversion and management	161014		ING-IND/32	ENG	1	Paolo Giangrande
		Monitoring and Assessment [Structural monitoring (3 CFU) + Structural assessment lab (3 CFU)]	161023	ICAR/08 ICAR/09	ENG	1	Rosalba Ferrari Andrea Belleri	
10		Lab course 2 (6 CFU)		6				
		Collaborative robotics (3 CFU) + Robots and automatic machinery for industrial applications (3 CFU)	161022		ING-INF/04 ING-IND/13	ENG	1	Manuel Giuseppe Catalano Paolo Righettini
		Laboratorio di elettronica (3 CFU) + Sensors (3 CFU)	161020		ING-INF/01	ITA-ENG	1	Luigi Gaioni Gianluca Traversi
		IT architecture in production	39187-ENG		ING-IND/13	ENG	2	Oliver Riedel
		Electric energy conversion and management	161014		ING-IND/32	ENG	1	Paolo Giangrande
		Monitoring and Assessment [Structural monitoring (3 CFU) + Structural assessment lab (3 CFU)]	161023	ICAR/08 ICAR/09	ENG	1	Rosalba Ferrari Andrea Belleri	

Mechatronic systems LAB (17 CFU) codice 161024							
11	Advanced mechatronics design	161008-1	4	ING-IND/13	ENG	2	Paolo Righettini
	Machine and structural design	161008-2	3	ING-IND/14	ENG	2	Mario Lavella
	Industrial IOT	161008-3	3	ING-INF/01	ENG	2	Gianluca Traversi
	Mechanical system control	161008-4	4	ING-INF/04	ENG	2	Nicholas Valceschini
	Embedded system software design	161008-5	3	ING-INF/05	ENG	2	Davide Brugali
12	Elective course (6 CFU)		12				
	Elective course (6 CFU)						
X	Computer and telematic skills (*)	39077	1				
X	Thesis work and final defense	161000	12				

(\*) included in thesis preparation

60

opt.	Additional elective activities (supernumerary credits)						
------	--	--	--	--	--	--	--

Each student must select:

- 1 course in position #7
- 1 course in position #10
- 2 elective courses in position #12

Smart Technology LAB (17 CFU) 161025							
11	Smart energy systems	161025-1	4	ING-IND/09	ENG	2	Giuseppe Franchini Giovanni Brumana
	Human-machine interaction	161010-2	3	ING-IND/15	ENG	2	Daniele Regazzoni Christian Spreafico
	Smart manufacturing technologies	161010-3	3	ING-IND/16	ENG	2	Chiara Ravasio
	Advanced production systems	161010-4	4	ING-IND/17	ENG	2	Chiara Cimini Paolo Gaiardelli
	Smart electrical infrastructure	161025-2	3	ING-IND/33	ENG	2	Mariacristina Roscia
12	Elective course (6 CFU)		12				
	Elective course (6 CFU)						
X	Computer and telematic skills (*)	39077	1				
X	Thesis work and final defense	161000	12				

(\*) included in thesis preparation

60

opt.	Additional elective activities (supernumerary credits)						
------	--	--	--	--	--	--	--

Each student must select:

- 1 course in position #9
- 1 course in position #10
- 2 elective courses in position #12

Curriculum: <b>MECHATRONICS</b>
---------------------------------

**Elective courses (taught in English)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Computational mechanics of solids and structures	60039-ENG	6	ICAR/08	ENG	1	Rosalba Ferrari
Computational fluid dynamics	39070-ENG	6	ING-IND/06	ENG	1	Alessandro Colombo
Internal combustion engines and vehicle aerodynamics	39046-ENG	6	ING-IND/08	ENG	2	Nicoletta Franchina Alessandro Colombo
Experimental techniques for fluid machinery	39204	6	ING-IND/08 (3) ING-IND/12 (3)	ENG	2	Giovanna Barigozzi
IT architecture in production	39187-ENG	6	ING-IND/13	ENG	2	Oliver Riedel
Mechatronic systems and advanced robotic applications	161026	6	ING-IND/13	ENG	1	Paolo Righettini
Quality management systems	22027-ENG	6	ING-IND/16	ENG	1	Pellegrini Giuseppe
Industrial plant design and simulation	161005	6	ING-IND/17	ENG	2	Chiara Cimini
Lean manufacturing	39122	6	ING-IND/17	ENG	2	Paolo Gaiardelli Daryl Powell
Materials for advanced engineering applications	39171-ENG	6	ING-IND/22	ENG	2	Sergio Lorenzi
Science and technology of light alloys	39109-ENG	6	ING-IND/22	ENG	2	Sergio Lorenzi
Electric energy conversion and management	161014	6	ING-IND/32	ENG	1	Paolo Giangrande
Data science and automation	39170-ENG	6	ING-INF/04	ENG	2	Davide Previtali
Collaborative robotics (3 CFU) + Laboratory Sustainable Industrial Systems SIS (3 CFU)	161021	6	ING-INF/04	ENG	1+2	Manuel Giuseppe Catalano Matteo Scandella
Embedded and real time systems	21038-ENG	6	ING-INF/05	ENG	1	Davide Brugali
Statistics for digital and organisational innovation	37195-E2	6	SECS-S/02	ENG	2	Otto Philipp Fassò Alessandro

**Other elective courses (taught in Italian)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Combustione e impatto ambientale	39209-1	6	ING-IND/08	ITA	1	Nicoletta Franchina
Tecnologie delle energie rinnovabili	39071	6	ING-IND/09	ITA	2	Giuseppe Franchini
Acustica applicata	60118	6	ING-IND/10	ITA	2	Maurizio Santini
Progettazione di impianti termotecnici	39096	6	ING-IND/10	ITA	2	Enzo Bombardieri
Termofluidodinamica	39020	6	ING-IND/10	ITA	1	Lorenzo Botti Gianpietro Cossali
Trasmissione del calore	39021	6	ING-IND/10	ITA	1	Gianpietro Cossali
Misure dimensionali e collaudi di produzione	39015	6	ING-IND/12	ITA	2	Roberto Frizza
Meccanica dei robot	39051	6	ING-IND/13	ITA	1	Bruno Zappa
Modellistica e simulazione dei sistemi meccanici	39052	6	ING-IND/13	ITA	1	Vittorio Lorenzi
Progettazione FEM	39056	6	ING-IND/14	ITA	2	Sergio Baragetti
Progetto di macchine	39055	6	ING-IND/14	ITA	2	Emanuele Vincenzo Arcieri
Innovazione di prodotto e di processo (6 CFU)	39218	6	ING-IND/15	ITA	1	Davide Russo
Metodi e strumenti per il ciclo di vita del prodotto	37008	6	ING-IND/15	ITA	2	Caterina Rizzi
Studi di fabbricazione	39057	6	ING-IND/16	ITA	2	Chiara Ravasio
Tecnologie di formatura (fonderia)	39106	6	ING-IND/16	ITA	1	Giancarlo Maccarini
Tecnologie di formatura (plasticità)	39105	6	ING-IND/16	ITA	1	Giancarlo Maccarini
Gestione della produzione industriale	21033	6	ING-IND/17	ITA	2	Fabiana Pirola
Corrosione e protezione dei materiali (6 CFU)	39010	6	ING-IND/22	ITA	1	Tommaso Pastore
Materiali polimerici, compositi e ceramici	39013	6	ING-IND/22	ITA	1	Denny Coffetti
Gestione aziendale e dei sistemi logistici	39076	6	ING-IND/35	ITA	2	Albachiara Boffelli
Elettronica industriale	21031	6	ING-INF/01	ITA	1	Massimo Manghisoni
Sensori	38058	6	ING-INF/01	ITA	1	Gianluca Traversi
Laboratorio di elettronica (3 CFU) + Sensors (3 CFU)	161020	6	ING-INF/01	ITA-ENG	1	Luigi Gaioni Gianluca Traversi
Laboratorio di elettronica (3 CFU) + Functional design of mechatronic systems (3 CFU)	161019	6	ING-INF/01 ING-IND/13	ITA-ENG	1+2	Luigi Gaioni to be defined
Automazione industriale	21052-1	6	ING-INF/04	ITA	2	Cataldo Andrea
Controlli automatici	39067	6	ING-INF/04	ITA	1	Fabio Previti
Intelligenza artificiale	38089-MOD1	6	ING-INF/05	ITA	2	Domenico Fabio Savo
Robotica	39068	6	ING-INF/05	ITA	1	Davide Brugali
Calcolo numerico	39064	6	MAT/08	ITA	1	Francesca Maggioni

The selection of other courses provided by the School of Engineering must be verified and approved by the Degree Program Board

A **curricular internship** or a **Summer / Winter School** or a **CREO-Lab** (max 6 credits) can be included among the 12 credits for elective courses after evaluation by the Degree Program Board

**Additional elective activities (supernumerary credits)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Etica e diritto per le professioni ingegneristiche	37211	6	IUS/20 IUS/08	ITA	2	Corrado Del Bo Barbara Pezzini
CREO-Lab Tourism and creative industries	44167-ENG	6		ENG		
CREO-Lab Salute	16021	6		ITA		
CREO-Lab Sustainability	179010-ENG	6		ENG		
CREO-Lab Tecnologie digitali e intelligenza artificiale	38110	6		ITA		

The selection of other courses provided by the School of Engineering must be verified and approved by the Degree Program Board

Curriculum: <b>SMART TECHNOLOGY ENGINEERING</b>
---

**Elective courses (taught in English)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Computational mechanics of solids and structures	60039-ENG	6	ICAR/08	ENG	1	Rosalba Ferrari
Monitoring and Assessment [Structural monitoring (3 CFU) + Structural assessment lab (3 CFU)]	161023	6	ICAR/08 ICAR/09	ENG	1	Rosalba Ferrari Andrea Belleri
Computational fluid dynamics	39070-ENG	6	ING-IND/06	ENG	1	Alessandro Colombo
Internal combustion engines and vehicle aerodynamics	39046-ENG	6	ING-IND/08	ENG	2	Nicoletta Franchina Alessandro Colombo
Experimental techniques for fluid machinery	39204	6	ING-IND/08 (3) ING-IND/12 (3)	ENG	2	Giovanna Barigozzi
IT architecture in production	39187-ENG	6	ING-IND/13	ENG	2	Oliver Riedel
Quality management systems	22027-ENG	6	ING-IND/16	ENG	1	Pellegrini Giuseppe
Lean manufacturing	39122	6	ING-IND/17	ENG	2	Paolo Gaiardelli Daryl Powell
Science and technology of light alloys	39109-ENG	6	ING-IND/22	ENG	2	Sergio Lorenzi
Electric energy conversion and management	161014	6	ING-IND/32	ENG	1	Paolo Giangrande
Collaborative robotics (3 CFU) + Robots and automatic machinery for industrial applications (3 CFU)	161022	6	ING-INF/04 ING-IND/13	ENG	1	Manuel Giuseppe Catalano Paolo Righettini
Embedded and real time systems	21038-ENG	6	ING-INF/05	ENG	1	Davide Brugali
Statistics for digital and organisational innovation	37195-E2	6	SECS-S/02	ENG	2	Otto Philipp Fassò Alessandro

**Other elective courses (taught in Italian)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Complementi di scienza delle costruzioni	60077-2	6	ICAR/08	ITA	1	Egidio Rizzi
Combustione e impatto ambientale	39209-1	6	ING-IND/08	ITA	1	Nicoletta Franchina
Tecnologie delle energie rinnovabili	39071	6	ING-IND/09	ITA	2	Giuseppe Franchini
Acustica applicata	60118	6	ING-IND/10	ITA	2	Maurizio Santini
Progettazione di impianti termotecnici	39096	6	ING-IND/10	ITA	2	Enzo Bombardieri
Termofluidodinamica	39020	6	ING-IND/10	ITA	1	Lorenzo Botti Gianpietro Cossali
Misure dimensionali e collaudi di produzione	39015	6	ING-IND/12	ITA	2	Roberto Frizza
Power drive systems for mechanical machinery and vehicles	161017	6	ING-IND/13	ENG	2	Bruno Zappa
Meccanica dei robot	39051	6	ING-IND/13	ITA	1	Bruno Zappa
Modellistica e simulazione dei sistemi meccanici	39052	6	ING-IND/13	ITA	1	Vittorio Lorenzi
Progettazione funzionale di sistemi meccanici	39073	6	ING-IND/13	ITA	1	Paolo Righettini
Mechatronic systems and advanced robotic applications	161026	6	ING-IND/13	ENG	1	Paolo Righettini
Progettazione FEM	39056	6	ING-IND/14	ITA	2	Sergio Baragetti
Progetto di macchine	39055	6	ING-IND/14	ITA	2	Emanuele Vincenzo Arcieri
Innovazione di prodotto e di processo (6 CFU)	39218	6	ING-IND/15	ITA	1	Davide Russo
Metodi e strumenti per il ciclo di vita del prodotto	37008	6	ING-IND/15	ITA	2	Caterina Rizzi
Studi di fabbricazione	39057	6	ING-IND/16	ITA	2	Chiara Ravasio
Tecnologie di formatura (fonderia)	39106	6	ING-IND/16	ITA	1	Giancarlo Maccarini
Tecnologie di formatura (plasticità)	39105	6	ING-IND/16	ITA	1	Giancarlo Maccarini
Gestione della produzione industriale	21033	6	ING-IND/17	ITA	2	Fabiana Pirola
Corrosione e protezione dei materiali (6 CFU)	39010	6	ING-IND/22	ITA	1	Tommaso Pastore
Materiali polimerici, compositi e ceramici	39013	6	ING-IND/22	ITA	1	Denny Coffetti
Gestione aziendale e dei sistemi logistici	39076	6	ING-IND/35	ITA	2	Albachiara Boffelli
Elettronica industriale	21031	6	ING-INF/01	ITA	1	Massimo Manghisoni
Laboratorio di elettronica (3 CFU) + Sensors (3 CFU)	161020	6	ING-INF/01	ITA-ENG	1	Luigi Gaioni Gianluca Traversi
Automazione industriale	21052-1	6	ING-INF/04	ITA	2	Cataldo Andrea
Controlli automatici	39067	6	ING-INF/04	ITA	1	Fabio Previti
Intelligenza artificiale	38089-MOD1	6	ING-INF/05	ITA	2	Domenico Fabio Savo
Robotica	39068	6	ING-INF/05	ITA	1	Davide Brugali
Calcolo numerico	39064	6	MAT/08	ITA	1	Francesca Maggioni

The selection of other courses provided by the School of Engineering must be verified and approved by the Degree Program Board

A **curricular internship** or a **Summer / Winter School** or a **CREO-Lab** (max 6 credits) can be included among the 12 credits for elective courses after evaluation by the Degree Program Board

**Additional elective activities (supernumerary credits)**

Course	Code	Credits	SSD	Taught	Semester	Professor
Etica e diritto per le professioni ingegneristiche	37211	6	IUS/20 IUS/08	ITA	2	Corrado Del Bo Barbara Pezzini
CREO-Lab Tourism and creative industries	44167-ENG	6		ENG		
CREO-Lab Salute	16021	6		ITA		
CREO-Lab Sustainability	179010-ENG	6		ENG		
CREO-Lab Tecnologie digitali e intelligenza artificiale	38110	6		ITA		

The selection of other courses provided by the School of Engineering must be verified and approved by the Degree Program Board