UNIVERSITÀ DI TRENTO

M3 — Multifunctional Metamaterials & Metastructures

Postgraduate Program
(Master Universitario II Livello)

Second Edition (2026)

UNIVERSITÀ DI TRENTO
Dipartimento di Ingegneria Civile, Ambientale e Meccanica

UNIVERSITÀ DI TRENTO
Dipartimento di Ingegneria Industriale

Objectives of the Program

- To train professionals with skills in analysis, design, analytical and computer modeling, simulation, and experimental validation in the field of **Multifunctional Metamaterials and Metastructures**

- To address theoretical/practical issues regarding

  - **Theoretical foundations** of Metamaterials and Multifunctional Metastructures in various disciplines according to the physical phenomena of interest

  - **Analysis techniques** of artificial materials and methods for their functional and logical characterization in **analytical and mathematical terms**

  - Large-scale **numerical modeling techniques of complex multifunctional structures**, also considering their multi-physical properties, through multi-scale techniques on **high-performance computing (HPC)** architectures and integration of hybrid approaches based on the use of **Artificial Intelligence**

  - **Realization, implementation, and experimental characterization** in labs from a mechanical, electromagnetic, and structural viewpoint of multifunctional artificial materials

  - **Cross-disciplinary applications** regarding multiple relevant scenarios, including the study of metamaterials and multifunctional metastructures in the **mechanical, structural, electromagnetic, energy, environmental and marine fields**

Grants and Opportunities

Available grants and opportunities at the following web-page:
https://master-m3.unitn.it/2026-grants

Admission Requirements

- Those in possession of one of the following qualifications can apply: (i) Master's Degree or single-cycle Master's Degree; (ii) foreign qualification (Master's Degree), recognized as suitable according to current legislation; (iii) 4-year Bachelor's Degree

- Applications should be submitted exclusively online.
  More info at: **https://master-m3.unitn.it/2026-admission**

The M³ Program

The Program includes a set of Standard Courses for a total of 42 ECTS (+10 ECTS of Lab Courses)

Courses taught in English and offered on-site and on-line (synchronous and asynchronous) with video recordings, hand-outs, etc. of the lectures available off-line

#	Standard Courses (Provisional)	H	ECTS	
1	Foundations of Materials Science	15	3	2/4 Constrained Choice
2	Foundations of Electromagnetic Waves	15	3	
3	Foundations of Mechanics and Acoustics	15	3	
4	Foundations of Waveguides Propagation	15	3	
5	Introduction to Multi-Functional Metamaterials	15	3	Mandatory Courses
6	High-Performance Computing (HPC) for Multifunctional Metamaterials and Metastructures	15	3	
7	Random Vibrations and Uncertainty Quantification for Metamaterials	15	3	
8	Analysis and Design of Linear and Nonlinear Metastructures	15	3	
9	Dynamics and Homogenization of Periodic Metamaterials	15	3	
10	Advanced Modeling of Exotic Metamaterials	15	3	
11	Hydrodynamic Metamaterials for Fluid Flows	15	3	
12	Metasurfaces and Metamaterials for Electromagnetic Wave Manipulation	15	3	
13	Additive Manufacturing of Metasurfaces and Metamaterials (Automation and Controls)	15	3	
14	Additive Manufacturing of Metasurfaces and Metamaterials (Technologies)	15	3	
15	Topological and Mechanical Characterization of Metamaterials	15	3	
16	Smart and Nano Metamaterials	15	3	

#	Lab Courses (Provisional)	H	ECTS
1	Lab on Design-based Materials Selection	15	2
2	Lab on AI-based Metamaterials & Metastructures Design	15	2
3	Lab on Additive Manufacturing of Metamaterials (Part I)	15	2
4	Lab on Additive Manufacturing of Metamaterials (Part II)	15	2
5	Lab on Metasurface Printing/ Manufacturing	15	2
6	Lab on Deployable Metamaterials	15	2
7	Lab on Metasurfaces for Smart Electromagnetic Environment	15	2
8	Lab on HPC for Multi-Functional Metamaterials and Metastructures	15	2
9	Lab on Advanced Computational Modeling of Mechanical Metamaterials	15	2
10	Lab on Product Design Fundamentals	15	2

5/10 Constrained Choice

The Courses include a combination of different teaching activities for a total of 1500 Hours

Activity Type (Provisional)	Hours	ECTS
Front lesson	210	42
Individual Study related to frontal lessons, including Self-Assessment sessions	808	
In-depth seminars and "hot-topic" tutorials	32	0
Lab activities (w/ Lab Coordinator)	75	10
Individual Study related to laboratory lessons, including Self-Assessment sessions	175	
Internship or Stage	150	6
Individual activity related to the Final Exam	50	2
Total	**1500**	**60**

Occupations and Fields of Activity

- Companies involved in the design, development, engineering, production, and operation of artificial materials and their applications

- Industries operating in the field of **mechanical** and **electronic** technologies for **avionics** and aerospace

- Industries operating in the field of **civil and environmental engineering** technologies, in particular in the fields of **anti-seismic and acoustic, thermal**, and **mechanical insulation**

- Industries operating in the design and development of both **terrestrial** and **space communications** and sensing systems;

- Industries operating in the field of **automotive** and next generation **land transport systems** technologies

- Companies operating in the **biomedical field** requiring skills for the development and use of systems based on artificial multifunctional materials

- **Materials engineering** companies

- **Research and development centers**, both public and private

Profile of the Study Program

- Degree: Postgraduate Program
  (Master Universitario II Livello)
- Language: English
- Duration: 1 year
- Period: Jan-Dec 2026
- ECTS: 60
- Fee: 3000 Euro

Read More

- Website: **https://master-m3.unitn.it**
- E-Mail: **2026.MAII.M3.UniTN.TRENTO.IT@unitn.it**

M3 Multifunctional Metamaterials & Metastructures

- DICAM: http://dicam.unitn.it
- DII: http://dii.unitn.it
- Director: Prof. Andrea MASSA

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