



“CORSO DI LAUREA MAGISTRALE INTERCLASSE” – MASTER DEGREE

MATERIALS AND CHEMICAL ENGINEERING FOR NANO, BIO, AND SUSTAINABLE TECHNOLOGIES

CLASS LM-22 (CHEMICAL ENGINEERING) AND LM-53 (MATERIALS ENGINEERING)

PLAN OF STUDY

Academic Year 2024-2025

The student can design a personalized plan of study by selecting the courses out of groups (“Fundamentals”, “Core”, “Complementary”). The available combinations lead to three main types of plans, focused on:

- Nanotechnology and biotechnology
- Sustainable technologies
- Industrial technologies

Each plan can be further personalized, either from the point of view of materials engineering, or from the point of view of chemical engineering.

About 85% of the credits (“CFU”) is offered in English.

The courses are classified based as follows (type of educational activity, “TAF”):

- TAF A = base courses
- TAF B = characterizing courses
- TAF C = complementary courses
- TAF D = elective courses
- TAF E = final thesis
- TAF F = other activities

1 st year - 57 credits (“CFU”)			
<i>Course</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Total CFU</i>
Molecular simulation	ING-IND/24	B	9
One course from group FUNDAMENTALS-1-I		B/C	9
One course from group CORE-1-I		B	9
One course from group COMPLEMENTARY-1		C	6
Two courses from group CORE-1-II		B/C	12
Elective courses (*)		D	9
Other activity from group “F” (**)		F	3
2 nd year - 63 credits (“CFU”)			
<i>Course</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Total CFU</i>
Three courses from group CORE-2-I		B	21
One course from group COMPLEMENTARY-2		C	6
Two or three courses from group FUNDAMENTALS-2-II		B/C	18
Elective courses (*)		D	6
Final thesis		E	12



The courses of type TAF B or C can be selected from the following groups:

GROUP FUNDAMENTALS-1-I					
<i>Course</i>	<i>Total CFU (credits)</i>	<i>Modules</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Module CFU</i>
Advanced materials science	9	Physics of materials and radiation-matter interaction	FIS/03	B/C	6
		Physical properties of materials	ING-IND/22	B	3
Chemical and biochemical reaction engineering	9		ING-IND/24	B	9

GROUP CORE-1-I					
<i>Course</i>	<i>Total CFU (credits)</i>	<i>Modules</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Module CFU</i>
Polymeric and composite materials	9	Polymers and polymeric materials	ING-IND/22	B	6
		Composite materials	ING-IND/22	B	3
Soft Materials and Drug Delivery	9		ING-IND/24	B	9

GROUP CORE-1-II					
<i>Course</i>	<i>Total CFU (credits)</i>	<i>Modules</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Module CFU</i>
Ceramic materials	6		ING-IND/22	B	6
Molecular biology for engineering	6		ING-IND/24	B	6
Experimental laboratory of nanotechnology and biotechnology	6		ING-IND/24	B	6
Strategic and critical materials	6	Strategic and critical raw materials	CHIM/07	B/C	3
		Substitution of critical materials	ING-IND/22	B	3

GROUP CORE-2-I					
<i>Course</i>	<i>Total CFU (credits)</i>	<i>Modules</i>	<i>Disciplinary area (SSD)</i>	<i>TAF</i>	<i>Module CFU</i>
Soft materials and drug delivery	9		ING-IND/24	B	9
Sustainable industrial chemistry	9		ING-IND/27	B	9
Polymeric and composite materials	9	Polymers and polymeric materials	ING-IND/22	B	6
		Composite materials	ING-IND/22	B	3
Green nanotechnologies, natural and bioinspired materials	6		ING-IND/22	B	6
Metallic materials and fracture mechanics	6		ING-IND/22	B	6
Advanced simulation for nanotechnology and biotechnology	6		ING-IND/24	B	6
Design for sustainability of products and processes	6	Design for sustainability of processes	ING-IND/24	B	3
		Sustainable materials: selection and design	ING-IND/22	B	3
Materials and systems for the energy transition	6	Electrical systems for the energy transition	ING-IND/31	C	3
		Materials for the energy transition	ING-IND/22	B	3



GROUP FUNDAMENTALS-2-II

Course	Total CFU (credits)	Modules	Disciplinary area (SSD)	TAF	Module CFU
Materials characterization and data analysis	12	Data analysis	CHIM/01	C	6
		Spectroscopic methods for materials characterization	CHIM/07	B/C	3
		Functional and microstructural characterization of materials	ING-IND/22	B	3
Process dynamics and control	9		ING-IND/26	B/C	9
Process design and optimization	9		ING-IND/24	B	9
Nanomaterials for nano&bio technologies	6		ING-IND/24	B	6

GROUP COMPLEMENTARY-1

Course	Total CFU (credits)	Modules	Disciplinary area (SSD)	TAF	Module CFU
Biomaterials, artificial organs and prostheses	6		ING-IND/34	C	6
Impiego industriale dell'energia	6		ING-IND/08	C	6

GROUP COMPLEMENTARY-2

Course	Total CFU (credits)	Modules	Disciplinary area (SSD)	TAF	Module CFU
Tecnologia delle energie rinnovabili	6		ING-IND/09	C	6
Enzyme kinetics	6		ING-IND/34	C	6

(**) OTHER ACTIVITIES - GROUP "F"

Course	Total CFU (credits)	Modules	Disciplinary area (SSD)	TAF	Module CFU
Italian Language (mandatory if the student does not have a B2 level in Italian)	3			F	3
Internship	3			F	3



(*) In the study plan, the student must register for elective courses (TAF D). All courses listed in the groups “Fundamentals”, “Core”, and “Complementary”, as well as the ones listed in the group “Elective Courses” below require no approval, i.e. students can add them directly through the online system “esse3”. The student can propose other elective courses, but they are subject to approval. The student cannot enroll in an elective course if s/he has already given the same or equivalent exam in previous courses of study.

(*) ELECTIVE COURSES (automatically approved)			
<i>Course</i>	<i>Modules</i>	<i>Disciplinary area</i>	<i>TAF</i>
Impianti di trattamento degli effluenti inquinanti (if activated) - IN ITALIAN	ING-IND/25	D	6
Termofluidodinamica computazionale - IN ITALIAN	ING-IND/10	D	9
Fluidodinamica - IN ITALIAN	ING-IND/06	D	9
La sicurezza ed igiene negli ambienti di lavoro - IN ITALIAN	ING-IND/35	D	6
Tecnologia meccanica - IN ITALIAN	ING-IND/16	D	6
Impianti di abbattimento delle emissioni - IN ITALIAN	ING-IND/17	D	6
Modellazione solida - IN ITALIAN	ING-IND/15	D	3
Progettazione per additive manufacturing - IN ITALIAN	ING-IND/14	D	6
Scienza dei materiali - IN ITALIAN	ING-IND/22	D	9
Metallurgia e corrosione - IN ITALIAN	ING-IND/22	D	9
Meccanica applicata alle macchine - IN ITALIAN	ING-IND/13	D	6
Termodinamica - IN ITALIAN	ING-IND/24	D	9
Ingegneria dei processi di separazione - IN ITALIAN	ING-IND/24	D	9
Fenomeni di trasporto - IN ITALIAN	ING-IND/24	D	9
Scienza delle costruzioni - IN ITALIAN	ICAR/08	D	9
Fondamenti di fisica delle superfici - IN ITALIAN	FIS/03	D	6
Tecniche di diffrazione avanzate - IN ITALIAN	ING-IND/08	D	3

EVALUATION

The level of knowledge will be evaluated by oral and/or written exams, as detailed by each instructor in the syllabus and at the beginning of the course.

FURTHER INFORMATION

1. The master degree (“Laurea magistrale”) in Materials and Chemical Engineering for Nano, Bio, and Sustainable Technologies is an interclass degree (“corso di Laurea interclasse”), i.e. it can be conferred in one of two different “degree classes” of the Italian system (“classi di laurea”): either Chemical Engineering (LM-22), or Materials Engineering (LM-53). The student is required to choose the degree class before the beginning of the second year.
2. Students are required to consult with the coordinator in order to identify the appropriate choices of courses, in order to design a plan of study in line with the degree class selected and with the student’s inclination.
3. Courses marked as “TAF B/C” are “characterizing” for one class and “complementary” for the other.
4. The final thesis consists in an original and independent work in the field of materials engineering and/or chemical engineering. It can take the form of an extensive analysis of the scientific literature on a current relevant topic, or a design project, or a research project based on experiments, theory, or computational simulation. The work can be carried out entirely at the University of Trieste and/or in collaboration with other universities, research centers, and industries – both domestic and international.