



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2023/24
MASTER DEGREE
Chemistry (Classe LM-54)
Students enrolled from the academic year 2013-2014

HEADING

Degree classification - Denomination and code:	LM-54 Chemistry
Degree title:	Dottore Magistrale
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Years of course currently available:	1st , 2nd
Access procedures:	Open, subject to entry requirements
Course code:	F5Y

PERSONS/ROLES

Head of Study Programme

Prof. Luigi Falciola

Degree Course website

<https://scienzechimiche.cdl.unimi.it/it>

Via Golgi, 19 - 20133 MILANO <http://www.chimica.unimi.it>

Via Celoria, 18 - 20133 MILANO Phone 0250325032 <https://www.unimi.it/it/node/360> <https://www.unimi.it/it/node/359/>

DSA and disability tutor

Mariangela Longhi Phone 02503 14226 <https://www.unimi.it/it/ugov/person/mariangela-longhi> Email: mariangela.longhi@unimi.it

Erasmus and international mobility tutor

Emma Gallo Phone 02503 14374 <https://www.unimi.it/it/ugov/person/emma-gallo> Email: emma.gallo@unimi.it

Internship and dissertation tutor

Paola Fermo Phone 02503 14246 <https://www.unimi.it/it/ugov/person/paola-fermo> Email: paola.fermo@unimi.it

Master's degree admission tutor

Luigi Lay Phone 02503 14062 <https://www.unimi.it/it/ugov/person/luigi-lay> Email: luigi.lay@unimi.it

Office for Didactic, Department of Chemistry

Sig. Antonino Nucera, Via Golgi 19 - 20133 MILANO Phone 02 50314419 dalle ore 10 alle ore 12 dal lunedì al venerdì, in altri orari previo appuntamento <https://fb.me/chimicamilano> per contattare: <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

Referent of the Quality Management System (QA) of The Bachelor's degree

Fabio Ragaini Phone 02503 14373 <https://www.unimi.it/it/ugov/person/fabio-ragaini> Email: fabio.ragaini@unimi.it

Study plan, transfer and credit recognition tutor

Pierluigi Mercandelli Phone 02503 14447 <https://www.unimi.it/it/ugov/person/pierluigi-mercandelli> Email: pierluigi.mercandelli@unimi.it

Tutors for teaching support

Alberto Vertova Phone 02503 14232 <https://www.unimi.it/it/ugov/person/alberto-vertova> Email: tutoring.chimica@unimi.it

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The Master's Degree in Chemical Sciences is part of the European standards of reference for Chemical Sciences intending to provide specific skills with particular regard to chemical disciplines and their applications.

The training of the graduate will be intended to provide:

- complete autonomy in the workplace, which allows to cover positions of high responsibility in the implementation of

projects and structures;

- the ability to apply innovative methods and techniques and to use complex equipment;
- a good command in the spectroscopic and structural characterization of chemical compounds, including materials used in cultural heritage;
- the possibility of fluently using, in written and oral form, at least one language of the European Union in addition to Italian;
- the ability to adapt to the continuous evolution of chemical disciplines and to interact with culturally contiguous professionals.

The goal is to train chemists capable of:

- develop the skills and knowledge suitable for carrying out professional activities in the field of chemical research (also in private practice), managing firsthand activities such as the application of chemical procedures and protocols, the development and characterization of new products and materials, the experimentation of new technologies;
- operate in the creative, organizational and operational phases of research in the chemical and chemical-pharmaceutical field in public and private laboratories, European and non-European, present in universities, hospitals, research centers, local and state authorities, research and development companies; participate in the theoretical and practical development of new technologies in the chemical field; manage with responsible tasks the organization of work in public and private analysis laboratories;
- operate both in industries and in public institutions, in order to manage personnel and equipment, and to respond to research / development needs, quality control in the framework of legislative regulations or production processes;
- transfer research results and knowledge to end-users in an appropriate manner.

The Master's Degree in Chemical Sciences also provides a cultural and experimental basis suitable for a possible continuation of advanced training in the PhD*.

Euromaster®.

The degree course in Chemical Sciences of the University of Milan is among the first in Italy to have received the EuroMaster Label in September 2010. EuroMaster accreditation is awarded by a special commission designated by the European Thematic Association, which brings together European universities and chemical societies.

The EuroMaster Label qualifies the qualification provided by the Master's Degree in Chemical Sciences as a degree recognized by other European university institutions and gives the right of access to postgraduate courses of a chemical nature in Europe.

Expected learning outcomes

Graduates in Chemical Sciences have the ability and knowledge to carry out highly qualified professional activities in the field of business management and research laboratories in the chemical and chemical-pharmaceutical fields.

In addition to a thorough knowledge of chemical science and technology and management tasks, he also possesses the rigor necessary to apply the scientific method on time.

It is able to organize research work, to define development themes and related programs, to ensure the joint integration of the various research sectors, to guarantee scientific updating as well as to verify the results achieved and promote their development and their application and has the ability to adapt to the continuous evolution of chemical disciplines and to interact with culturally contiguous professionals.

Making judgements

Acquisition of conscious autonomy of judgment with reference to: interpretation of experimental data and possession of the appropriate tools to frame the specific chemical knowledge in their relations with other scientific and technical disciplines, design and implementation of an experiment, planning the times and methods, and full autonomy of judgment in evaluating and quantifying the final result, responsibility and management of projects, structures and personnel, identification of new perspectives and innovative strategies for the development, evaluation, interpretation and re-elaboration of literature data, professional ethics, ability to formulate an analytical problem and to propose ideas and solutions, including innovative ones, ability to find and evaluate sources of information, data, chemical literature.

Communication skills

Ability to comprehensively communicate the results of their research and evaluations to interlocutors even non-specialists in Chemical Sciences. Ability to interact with foreign partners, through the use of a language of the European Union, with particular reference to English. Development of relational skills, with particular reference to the ability to coordinate group activities, this ability will also be developed by encouraging the interaction between the work programs of the master's student with groups of students of degree courses and PhD students during the thesis period.

Learning skills

Graduates have the ability to update their scientific and professional training also through continuous consultation of bibliographic sources and databases. Possesses the ability to work for objectives independently and in groups, reacting positively to the problems encountered, is equipped with an aptitude for the development and continuous updating of knowledge both in the chemical field (specialized texts, scientific journals and multimedia teaching tools also in foreign languages) and in related and integrative sectors (also of a legal and / or economic nature), necessary for the management of complex projects.

Professional profile and employment opportunities

The professional profiles of reference are: Chemist, Quality assurance manager, manager / director of chemical and pharmaceutical laboratories, Representative and scientific communicator

Among the activities that graduates can carry out are indicated in particular: the promotion and development of scientific and technological innovation, as well as the management and design of technologies, and the exercise of functions of high responsibility in the sectors of industry, environment, health, cultural heritage and public administration.

For the graduate of this class is expected to enroll in the Register of the National Federation of the Orders of Chemists and Physicists as Chemist, after passing the State Exam.

Initial knowledge required

Requirements and knowledge required for access

Graduates of class L-27 Chemical Sciences and of the corresponding class relating to DM 509/99 can access the master's degree course in Chemical Sciences, which is recognized as having full possession of the curricular requirements, necessary to face the master's studies.

Graduates of other class degree courses can also access it, as well as those in possession of a qualification obtained abroad, recognized as suitable, provided that they demonstrate that they possess the necessary skills to successfully follow their studies. The curricular requirements required for admission to the degree course in Chemical Sciences are those of graduates of classes L-27. In particular, the following are required:

=> at least 20 ECTS in mathematical, computer science and physical disciplines;

=> at least 70 ECTS in the scientific-disciplinary sectors of the characterizing areas of the Table of class L27:

- chemical-analytical and environmental disciplines (CHIM/01 and CHIM/12)
- chemical-physical and chemical-inorganic disciplines (CHIM/02 and CHIM/03)
- chemical-industrial and technological disciplines (CHIM/04, CHIM/05, ING-IND/21, ING-IND/22 and ING-IND/25)
- chemical-organic and biochemical disciplines (CHIM/06, BIO/10, BIO/11 and BIO/12).

The possible presence of CFUs in scientific-disciplinary sectors not included among those listed will be evaluated by the commission for access to the Degree Course.

Italian and foreign students with an academic degree obtained in Italy must necessarily submit an application for admission online, in the period and according to the methods indicated on the site

<https://www.unimi.it/it/corsi/corsi-di-laurea/scienze-chimiche> where you can also find all the up-to-date information on the admission procedure.

Undergraduates who intend to graduate by December 31, 2023 can also apply for admission.

Methods of verification of knowledge and personal preparation

Admission requires the possession of the above curricular requirements and adequate personal preparation that will be evaluated by a Commission composed of at least three teachers of the CDs, appointed by the Didactic College of Chemical Sciences and Technologies. The test to verify the adequacy of the preparation of candidates is selective even if the above curricular requirements are met.

In particular, the verification of knowledge and personal preparation will be verified in the following ways:

a) execution of the European chemistr Test (<https://ectn.eu/committees/virtual-education-community/echemtest/>) for the assessment of skills in Chemistry, provided by the European chemistr Th

Network. The test includes questions, in English, multiple choice on topics grouped into four sections: Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry.

The test is considered passed if at least 20% of correct answers have been given in each of the four sections. In case of slight deficiencies (15-19%) the Access Commission reserves the right to summon the candidate in any case to better assess his preparation;

b) interview with the Access Commission that will focus on topics related to the disciplines dealt with in the fundamental courses of the Degrees of the Class L-27. The negative result obtained in the interview with the Access Commission, entails the foreclosure of access to the Master's degree course for the current year.

The EChemTest will take place in July and September 2023, according to a calendar that will be communicated on the website of the Course of Study (<https://scienzechimiche.cdl.unimi.it/it>). The test will be delivered remotely. An identification document is required to carry out the test. In the following days the interview with the Access Commission will be scheduled (possibly even remotely). A further edition of the EChemTest, for any recoveries of deficiencies, will take place in December 2023, with its subsequent interview. It is possible to take only a recovery test, subsequent to the one carried out and in which insufficiency has been found in one or more parts of the same.

The test and the interview can be carried out even before the graduation, subject to the possession of the curricular requirements indicated above.

ALL CANDIDATES, INCLUDING THOSE WHO PLAN TO GRADUATE BY DECEMBER 31, 2023, ARE WARMLY INVITED TO PRESENT THEMSELVES AT THE FIRST (July) or SECOND (September) TEST AND THEN INTERVIEW BY ADMISSION.

Graduates who have successfully passed the verification tests will be able to enroll after 5 working days from the date of verification, in the terms indicated on the site <https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-masters-programme>

For extra EU students, who may have visa and/or residence permit problems, an EChemTest will also be scheduled in May. In addition, it will be possible for them to schedule the interview remotely using a video conferencing platform. We strongly advise these students to use this opportunity to avoid the risk of not being able to obtain all the documentation for matriculation in good time.

Compulsory attendance

Attendance is mandatory for laboratory activities, and strongly recommended in all other cases.

Internship criteria

The thesis consists of a written dissertation on original chemical research carried out by the student, under the guidance of a Supervisor and, possibly, a Co-supervisor and carried out in the research laboratory specified in the application for admission.

The duration of the thesis internship is at least one calendar year, including the frequency of the courses planned in the same year.

Degree theses are distinguished in:

- Internal Experimental Theses
- External Experimental Theses

Internal experimental theses are considered those carried out at the Department of Chemistry or the Departments connected to the Faculty of Science and Technology of the University of Milan.

As part of these internal theses, in agreement with the Thesis Supervisor, it will be possible to carry out internships at public or private institutions or companies, under the guidance of an external supervisor. The duration of the internship may correspond to a maximum of 20 ECTS, even in non-continuous periods. These internship periods must however be approved by the Teaching Board of the Department of Chemistry.

External experimental theses are considered those carried out at other university structures, at the University of Milan or at another University, at public bodies or at highly qualified public and private Research centers (nonprofit), equipped with adequate structures. On the admissibility of these Theses the Teaching Board of the Department of Chemistry expresses itself.

In this case, the student is required to apply for admission to the external thesis laboratory by attaching:

- motivation of the request for an external experimental thesis (a typewritten folder) signed by the student and countersigned by the speaker (he must meet the characteristics of Official Speaker indicated below);
- detailed search schedule (a typed folder);
- a statement from the head of the host Structure attesting to the readiness to host the graduate free of charge and to grant him, always free of charge, the use of scientific equipment.

Applications must be submitted well in advance to allow the approval of the CD of the month preceding the entry into the Thesis. In this regard, please consult the relevant regulations, downloadable from the CDs website, and the Thesis and Internship Commission.

Students in internships at external institutions or companies and students in external experimental thesis are required to report, on a fortnightly basis, to the speaker and to another competent teacher, appointed by the Thesis and Internship Committee after hearing the speaker, on the experience conducted outside the Department and on the activities carried out there.

It is possible to apply for admission to the Thesis internship from the end of the second semester of the first year of the course.

For entry into the Thesis internship it is necessary to have already obtained the recognition of the knowledge of the English language at level B2.

The entries in the thesis take place on the first day of the months of July, October, December and March. Applications for admission must be sent to the Didactic Office of the Department of Chemistry and, for knowledge and endorsement, to the speaker, within the first day of the month prior to the month of entry, for approval by the Didactic College.

The Supervisor of the Degree Thesis is the scientific guarantor towards the CD of the research assigned to the graduate and its correct conduct. The Rapporteur is unique. All Professors and Researchers, who carry out chemical teaching activities, belonging to the Didactic College or to the Department of Chemistry or to the Departments connected to the Faculty of Science and Technology, can be Speakers. The Rapporteur may be assisted by a maximum of two Co-Rapporteurs.

Detailed information can be found in the Thesis Regulations downloadable from the page " Stage and Internships " of the Magistrale: <https://scienzechimiche.cdl.unimi.it/en/study/stage-and-internship>

Degree programme final exams

To be admitted to take the final exam, the student must have passed all the exams provided for in the study plan.

The final exam consists in the discussion of the thesis in front of a special Commission of the Didactic Board. The Thesis can be written in Italian or foreign language. In both cases it is required to prepare a summary in English (maximum 5 typed pages), to be delivered on time

indicated on the site <https://scienzechimiche.cdl.unimi.it/it/studiare/laurearsi>

- July 2024
- October 2024
- December 2024
- February 2025
- April 2025

Notes

In order to obtain their degree, students must be proficient in English at a B2 level. This proficiency level may be certified as follows:

- By submitting a language certificate attesting B2 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/297/>). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal <http://studente.unimi.it/uploadCertificazioniLingue>;

- B2 or higher level achieved during a University of Milan degree programme and certified by the University Language Centre (SLAM) no more than four years before the date of admission application. In this case the process is automatic, the applicant does not have to attach any certificates to the application

- Through a placement test administered by the SLAM between October and January of year 1. Applicants who fail the test will be required to take a SLAM course.

The placement test is mandatory for all those who do not hold a valid certificate.

Those who do not take the placement test by January or do not pass the end-of-course exam after six attempts must obtain the necessary certification privately before graduating.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from the 27 EU member countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions.

Study and internships abroad

As part of the study plan, students can participate in Erasmus program projects activated for the Degree Course. In particular, under the Erasmus+ programme, students can choose from 20 affiliated European universities. At these locations, students can earn credits by following the teachings and passing the relevant exams, or through the performance of part of the experimental thesis. The acquisition of training credits is subject to the approval by the Didactic College of a specific study plan (the Learning Agreement) and to the passing of exams at the foreign office.

Some courses of the Degree Course are currently taught in English. In addition, within the 12 ECTS of free choice, there are also the numerous courses of the Master's Degree in Industrial Chemistry and other Master's Degree courses delivered in English, in order to increase students' familiarity with the language common to the scientific world and to facilitate their mobility to European locations. In fact, in many of the Erasmus affiliated universities, the Master's degree courses are delivered exclusively in English.

Students can also participate in the numerous seminar meetings with foreign teachers.

The degree course also provides integrated paths of study with the release of the double degree (<https://www.unimi.it/it/internazionale/studiare-allestero/double-degree>)

How to participate in Erasmus mobility programs

How to participate in Erasmus+ mobility programmes

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.

The University organizes informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be supplemented by the University funding for disadvantaged students.

Language courses

Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University Language Centre (SLAM).

<https://www.unimi.it/en/node/8/>

Learn more at <https://www.unimi.it/en/node/274/>

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

Contacts: InformaStudenti; mobility.out@unimi.it

Student Desk booking through InformaStudenti

1st COURSE YEAR Core/compulsory courses/activities common		
Learning activity	Ects	Sector
English proficiency B2 (3 ECTS)	3	ND
	Total compulsory credits	3
Elective courses		
The student must choose 2 from the following courses		
Analytical Chemistry	9	CHIM/01
Inorganic chemistry A	9	CHIM/03
Inorganic Chemistry B	9	CHIM/03
Organic chemistry A	9	CHIM/06
Organic chemistry B	9	CHIM/06
Physical chemistry A	9	CHIM/02
Physical chemistry B	9	CHIM/02
Student must earn 12 CFU by selecting 2 of the following items following teachings related and integrative.		
(Bio)nanotechnology	6	FIS/03
Chemical Safety <i>subscribed by MD in Industrial Chemistry</i>	6	IUS/07
Mathematical methods applied to chemistry	6	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
Medicinal chemistry	6	CHIM/08
Patents and Management of Innovation	6	SECS-P/07
Programming C	6	INF/01
The articulation of the courses in the semesters is described in the section "articulation of the courses".		
=====		
NOTA BENE: THE COURSES DENOMINATED IN ENGLISH ARE KEPT IN THIS LANGUAGE		
=====		
2nd COURSE YEAR Core/compulsory courses/activities common		
Learning activity	Ects	Sector
Thesis work and Final dissertation	39	NA
	Total compulsory credits	39
Elective courses		
The student must earn 12 credits by choosing freely between all the teachings activated, offered by the University, provided they consistency with the educational project, even if they are held in Italian.		
However, it is strongly recommended to use distinctive or, as appropriate, elective or integrative courses of the Related and Integrative courses of of the Chemical Master's Degrees consistent with the educational project.		
Further elective courses		
TABLE 2		
In the first and second year the student must choose, from the following table, courses for a total of 36 CFU according to the following criteria:		

- Analytical and environmental chemical disciplines (CHIM / 01 and CHIM/12): minimum 6 and maximum 12 CFU
- Inorganic and physico-chemical disciplines (CHIM / 02 and CHIM/03): minimum 12 and maximum 42 CFU
- Organic chemical disciplines (CHIM / 06): minimum 6 and maximum 36 CFU
- Industrial chemical disciplines (CHIM / 04 and ING-IND): maximum 6 CFU

Advanced electroanalytical chemistry	6	CHIM/01
Advanced methods in organic synthesis <i>2nd year</i>	6	CHIM/06
Advanced physics methods in organic chemistry	6	CHIM/06
Applied colloid and surface chemistry	6	CHIM/02
Bioinorganic Chemistry	6	CHIM/03
Bioorganic chemistry	6	CHIM/06
Catalytic Methodologies in organic chemistry	6	CHIM/06
Catalytic processes	6	CHIM/02
Chemistry of heterocyclic compounds	6	CHIM/06
Chemistry of organic natural substances	6	CHIM/06
Crystal Chemistry	6	CHIM/02
Databases and Cheminformatics Fundamentals	6	CHIM/06
Electrochemistry	6	CHIM/02
Environmental chemistry	6	CHIM/12
Environmental electrochemistry <i>Course subscribed by the MD in Industrial Chemistry and activated in alternate years: Not active in 2023-2024, active in 2024-2025.</i>	6	CHIM/02
History of Chemistry	6	CHIM/03
Homogeneous catalysis	6	CHIM/03
Nanoparticles: Chemistry and Applications	6	CHIM/06
Organometallic chemistry	6	CHIM/03
Photochemistry <i>Not active in 2023-2024</i>	6	CHIM/02
Photoluminescence and magnetic resonance: applications in organometallic and inorganic chemistry	6	CHIM/01
Physical Chemistry of Materials	6	CHIM/02
Physical chemistry of solid state and surface	6	CHIM/02
Physico-chemical methods of investigation applied to molecular systems and nanostructured	6	CHIM/02
Quantum chemistry	6	CHIM/02
Simulation modeling of biomolecules	6	CHIM/02
Solid state chemistry	6	CHIM/03
Special synthesis techniques in organic chemistry	6	CHIM/06
Structural biology and enzymology <i>Course borrowed from "Protein engineering and molecular enzymology" (MD in Molecular Biotechnology and Bioinformatics)</i>	6	BIO/10
Structural chemistry	6	CHIM/03
Supramolecular chemistry	6	CHIM/03
Synthesis and applications of inorganic materials	6	CHIM/03
Theoretical chemistry	6	CHIM/02