



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2022/23
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>

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

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CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

Graduates of the Master's Degree in Chemical Sciences will have training aimed at providing:

- an in-depth cultural preparation in the various sectors of chemistry, in its theoretical and experimental aspects;
- full mastery of the scientific method of investigation and of the mathematical and computer tools to support it;
- a wide autonomy in the field of work, which allows the assumption of high positions of responsibility in the

implementation of projects and structures;

- the acquisition of techniques useful for the understanding of phenomena at the molecular level and specialized skills in a specific field of chemistry and biochemistry;
- extensive knowledge in the field of the most modern methods of analysis and synthesis of chemical compounds, such as drugs, bioorganic and bioinorganic molecules, new materials, homogeneous and heterogeneous catalysts;
- a solid preparation for the application to chemical systems of theoretical simulation methods of simulation and computational modeling.

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.

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

Qualifications and knowledge required for admission

Graduates in Chemical Science and Technology (Class L-27, or Class 21 under Ministerial Decree 509/99) from any Italian university can access the Master's degree programme in Chemistry, provided they meet all curricular requirements.

Graduates of any other degree class from any Italian university, as well as those holding a qualification obtained abroad and recognized as suitable, can also access the programme, provided they meet curricular requirements. For graduates from Class L-27 Bachelor's degree programmes of the University of Milan, all credits previously earned will count towards curricular requirements.

All other students must prove that they meet Class L-27 curricular requirements. In particular, applicants must meet the following requirements:

- at least 20 CFU in maths, computer and physics disciplines;
- at least 70 CFU in core subject areas for this class: CHIM/01-06, CHIM/12, ING-IND/21-22, ING-IND/25 and BIO/10-12.

Any credits earned in other fields will be assessed by the board for admission to the degree programme.

Italian and foreign students with academic qualifications obtained in Italy must submit an online admission application within the deadline posted to the website: <https://www.unimi.it/en/education/chemistry-0>, where you can also find updated information on the admission process.

Upcoming graduates who intend to graduate by 31 December 2022 may also apply for admission.

Admission assessment

In addition to the above requirements, applicants must have adequate knowledge, which will be assessed by a board of at least three faculty members, to be appointed by the Academic Board for the study programme.

Applicants must satisfy both curricular and extra-curricular requirements.

More specifically, the admission assessment will include the following:

a) European Chemistry Test (EChemTest, <https://ectn.eu/committees/virtual-education-community/echemtest/>), administered by the European Chemistry Thematic Network. The test includes multiple-choice questions in English on topics grouped into four sections: Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry. In order to pass the test, candidates must give at least 20% correct answers in each of the four sections. Applicants falling slightly below the threshold (15-19%)

may be invited to an assessment interview;

b) Admission interview with the board that will focus on core subjects for the L-27 class. Candidates who fail the interview with the Admission Board may not enrol on the Master's degree programme for the current year.

The EChemTest will take place in July and September 2022. The schedule will be posted to the programme website (<https://scienzechimiche.cdl.unimi.it/en>). The test will be delivered remotely. An ID is required to sit for the test. In the following days an interview with the Admission Board will be scheduled (possibly remotely). Failing candidates may sit for the EChemTest and interview again in December 2022. It is possible to repeat the test only once, in the subsequent session after the failed test. Candidates may also take the test and interview before graduating, without prejudice to the above-listed curricular requirements.

ALL CANDIDATES, INCLUDING THOSE WHO PLAN TO GRADUATE BY 31 DECEMBER 2022 ARE INVITED TO ATTEND THE FIRST (JULY) OR SECOND (SEPTEMBER) ADMISSION TEST AND INTERVIEW.

Graduates who passed the assessment test may enrol after 5 working days from the assessment date, within the deadline

posted to the website <https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-masters-programme>

For non-EU students, who may have visa and/or residence permit issues, an EChemTest will also be scheduled in May. Furthermore, it will be possible for them to schedule a remote interview on a videoconferencing platform.

Compulsory attendance

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

Internship criteria

The degree thesis consists of a written paper on original chemistry research conducted by the student under the guidance of a supervisor and, possibly, a co-supervisor in the research laboratory noted in the call for applications.

The thesis internship will last at least one calendar year, including attendance of classes contemplated for the same year.

There are two types of degree theses:

- Internal experimental theses
- External experimental theses

For internal experimental theses, thesis work is conducted 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 theses, in agreement with the thesis supervisor, students may undertake internships at public or private institutions or firms, under the guidance of an external supervisor. Internship hours cannot exceed 20 CFU. The internship may be completed over an uninterrupted period or over several periods, subject to the Academic Board's approval.

For external experimental theses, thesis work is conducted at other university facilities, whether at the University of Milan or another University, at public institutions or highly qualified public or private non-profit research centres, with adequate equipment. External theses must be approved by the Academic Board.

Applications for external theses must be submitted well in advance, so that approval may be granted the month before starting thesis work, with the following attachments:

- reason for applying for an external experimental thesis (one typewritten page) signed by the student and countersigned by the supervisor;
- detailed research plan (one typewritten page);
- a declaration by the head of the host facility stating their willingness to host the student and grant him/her the use of scientific equipment free of charge.

Please review the applicable regulations, which are available on the programme website.

Students in internships at external institutions or firms and students conducting external experimental theses must report on a fortnightly basis to their supervisor and another faculty member as appointed by the thesis and internship board after consulting the supervisor.

Students can apply for thesis internships as of the end of the second semester of Year I. Before starting their thesis internship, the student must pass a B2 English language proficiency assessment.

Thesis internships start on the first day of July, October, December and March. Applications must be submitted to the Academic Office of the Department of Chemistry, and to the supervisor for information, by the first day of the month preceding the start month, for approval by the Academic Board.

The thesis supervisor guarantees the scientific value of the thesis before the Academic Board. There is one supervisor only for each thesis. All professors and research fellows who sit on the Academic Board or teach chemistry at the Department of Chemistry, or at the Departments connected to the Faculty of Science and Technology, may be supervisors. The supervisor may be assisted by up to two co-supervisors.

The following may be co-supervisors, in addition to all faculty members included among official supervisors:

- Official faculty members of other universities and polytechnics, including international ones;
- Graduates who are recognized experts in the field;
- Expert employees of the University of Milan at or above D level;
- C.N.R. researchers operating within the Department of Chemistry;
- Experts appointed by host institutions for external theses.

Degree programme final exams

In order to be admitted to the final exam, you must have passed all the exams required by the study plan.

The final exam consists of the discussion of the degree thesis before a special committee of the Academic Board. The degree thesis may be written in Italian or a foreign language. In either case, an English abstract is required (maximum 5 typewritten pages), to be submitted within the deadlines posted to <https://scienzechimiche.cdl.unimi.it/en/study/graduating>

FINAL EXAM SESSIONS

- July 2023
- October 2023
- December 2023
- February 2024
- April 2024

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:

- Through a language certificate, earned within three years prior to the date of submission, at a B2 level or higher. For the list of language certificates recognised by the University, please review: <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>;
- Through a Placement Test, which is delivered by the University Language Centre (SLAM) during year I only, from October to January. Students who fail the test will be required to take a SLAM course. The Placement Test is mandatory for all students who do not hold a valid certificate. Those who do not sit the Placement Test by January, or who fail to pass the end-of-course test within six attempts, must obtain a paid certificate by graduation.

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 the Erasmus programme projects activated for the Degree Course. In particular, under the Erasmus+ programme, students can choose from 20 European partner universities. At these locations students can earn credits by following courses and passing the relevant exams, or by carrying out part of the experimental thesis. The acquisition of credits is subject to the approval by the Academic Board of a specific study plan (the Learning Agreement) and to the passing of the exams at the foreign institution.

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

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

The degree course offers integrated study programmes that award joint/multiple degrees (<https://www.unimi.it/en/international/study-abroad/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		
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	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
<p>The articulation of the courses in the semesters is described in the section "articulation of the courses".</p> <p>=====</p> <p>NOTA BENE: THE COURSES DENOMINATED IN ENGLISH ARE KEPT IN THIS LANGUAGE</p> <p>=====</p>		
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		
<p>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.</p>		
Further elective courses		
TABLE 2		
<p>In the first and second year the student must choose, from the following table, courses for a total of 36 CFUs so that</p> <ul style="list-style-type: none"> - at least 6 credits belong to the chemical-analytical and environmental disciplines: CHIM/01 and CHIM/12 - at least 6 credits belong to the chemical-organic disciplines: CHIM / 06 - at least 12 credits belong to the disciplinary field "chemical-inorganic and chemical-physical disciplines": CHIM/03 and CHIM/02. <p>It is considered useful to point out that in the next academic year will be active also the course "Catalytic Processes". (6 CFU - CHIM/02).</p>		
Advanced electroanalytical chemistry	6	CHIM/01
Advanced methods in organic synthesis	6	CHIM/06
Advanced physics methods in organic chemistry	6	CHIM/06
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 analytical chemistry	6	CHIM/01
Environmental chemistry	6	CHIM/12
Environmental elettrochemistry	6	CHIM/02
Homogeneous catalysis	6	CHIM/03
Nanoparticles: Chemistry and Applications	6	CHIM/06
Organometallic chemistry	6	CHIM/03
Photochemistry	6	CHIM/02
Photoluminescence and magnetic resonance: applications in organometallic and inorganic chemistry	6	CHIM/01
Physical chemistry of disperse systems and of interfaces	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	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