



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2024/25**  
**BACHELOR**

**Chemical safety and Toxicological Environmental Sciences (Classe L-29)**  
**enrolled from 2009/10 academic year**

### **HEADING**

<b>Degree classification - Denomination and code:</b>	L-29 Pharmacy
<b>Degree title:</b>	Dottore
<b>Length of course:</b>	3 years
<b>Total number of credits required to complete programme:</b>	180
<b>Years of course currently available:</b>	2nd , 3rd
<b>Access procedures:</b>	Cap on student, student selection based on entrance test
<b>Course code:</b>	E17

### **PERSONS/ROLES**

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#### **Degree Course website**

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

#### **FIRST ENROLMENT**

<https://www.unimi.it/it/studiare/immatricolarsi-e-iscriversi>

#### **Pharmacy course management**

via Golgi 19 - Edificio 1, ingresso D - 20133 MILANO lun, merc, ven 9:30-11:30; mar e gio 13:30-15:30

<https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

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#### **Student registrar**

Sedi e orari: <https://www.unimi.it/it/node/360>

#### **Student registrar**

Contatti: <https://www.unimi.it/it/node/359> Phone 0250325032

## **CHARACTERISTICS OF DEGREE PROGRAMME**

### **General and specific learning objectives**

The relationship with the environment is a key determinant of human health. From polluted cities to uncontaminated forests, the relationship between the individual and different environmental factors can result in different states of well-being or disease. Understanding the elements to be taken into account, from an epidemiological point of view, to assess the impact of different factors on health is a very complex task. Only through the intersection of environmental, territorial, urban, epidemiological and mortality data, as well as other health, demographic, cultural and social indicators, can we model potential scenarios for a given population to regulate health and outline any policy actions to improve the health of the population and limit the damage resulting from specific environmental drivers. The environment can indirectly or directly affect health. It can promote the circulation of pathogens and other biological factors, such as pollens and other allergens, which, when present, affect the susceptible population. However, it can also act by means of non-biological drivers, such as the presence of chemical and physical contaminants: in this case, it is more difficult to determine a cause-effect relationship and epidemiological studies try to describe and quantify the damage from exposure, both acute and chronic, to different substances. In general, preventing toxic effects of environmental origin requires a complex effort both on behaviour and lifestyles, as well as on the rules and institutional measures that can guarantee the safety of the population exposed to environmental risks.

Graduates in Chemical safety and Toxicological Environmental Sciences will contribute to the improvement of environmental conditions by identifying harmful situations in the living environments, which may cause damage to the population. They will work to remove dangerous situations and achieve better environmental conditions including the quality and safety of the elements that are part of the food chain. In addition, from a social standpoint, they can help foster cultural and scientific aggregation, to protect the environment and therefore population health, to relaunch cultural commitment on this issue and promote, through debate, information and initiatives, the protection of the environment and an improvement in the health conditions of the population.

### **Expected learning outcomes**

Knowledge and understanding

Expected learning outcomes include theoretical and practical skills with reference to: foundations of mathematics, physics, computer science, chemistry, general biology, cellular and molecular biology of prokaryotic and eukaryotic organisms, biochemistry, human anatomy and bioinformatics.

This knowledge, acquired mainly in the first year of the SSCTA programme, is essential to tackle professional training in the second and third years. In particular, students will hone Chemical-toxicological Analysis, Pharmaceutical Technology and Legislation, Food Chemistry, Pharmacology, Toxicology, General Pathology.

Lectures, seminars, laboratory exercises, classroom exercises in small groups and video exercises will allow students to acquire basic, specialist and pre-professional knowledge.

Moreover, students will become fluent in English, with particular reference to scientific literature.

Students will also acquire knowledge in the field of professional disciplines such as Chemical-toxicological Analysis, Pharmaceutical Technology and Legislation, Food Chemistry, Pharmacology, Toxicology, General Pathology.

Moreover, students will become fluent in English, with particular reference to scientific literature.

Lectures, seminars, laboratory exercises, classroom exercises in small groups and video exercises will allow students to acquire basic, specialist and pre-professional knowledge.

### Applying knowledge and understanding

Graduates will be able to effectively apply their basic, theoretical and technical skills in their profession.

SSCTA graduates can apply analytical-experimental methodologies in the fields of analytical, biological, microbiological, biotechnological and toxicological application to ensure environment and workplace safety, food safety and human health protection.

This outcome will be achieved through a highly professional training programme with lectures and exercises, as well as a practical internship. This internship will allow students to learn how to apply their knowledge independently in their profession. At the end of the programme, students will be aware of their professional role both in terms of individual responsibility and proactive cooperation with other professionals in a multidisciplinary team.

Expected learning outcomes in terms of know-how will be assessed through interim tests and a final exam consisting of thesis work on the internship, under the supervision of the academic and corporate tutors.

### Making judgements

Students will learn to make judgements throughout the programme, culminating in thesis work and a practical internship. Academic assessments will evaluate the students' ability to master the scientific method of investigation. The ability to acquire information and to collect and interpret the data deemed useful to make judgments results in the proper management of toxicological problems to protect the environment and ensure population safety.

### Communication skills

Communication skills will leverage on adequate knowledge and tools for scientific communication in Italian and English, computer skills, organisation, presentation and discussion of experimental data, ability to work in a group. To achieve these objectives, students will complete seminars, exercises, written and oral exams and an internship, in which they must prepare reports and written papers to be presented orally.

Moreover, communication skills will be honed and assessed by writing and discussing the final paper. These skills include the ability to communicate in English (level B1) on scientific-toxicological issues (scientific English).

### Learning skills

SSCTA graduates:

- have lifelong learning skills in the chemical-toxicological and environmental fields;
- are able to use IT tools for the consultation of databases and specialist literature for preparing scientific papers, with a focus on toxicology;
- have learned the skills required to continue their studies through Master's degree programmes.

These skills are assessed through intermediate tests, the discussion of scientific articles, oral and written exams, and reports on laboratory exercises, if any.

## **Professional profile and employment opportunities**

### Chemical Technicians

job function:

Chemical technicians will assist specialists in the analysis of solid, liquid and gaseous materials conducted in the field of chemical research or for production activities requiring new process or product development; they will assist specialists in production quality control and maintenance of environmental quality, operation and safety standards of equipment, plants and technical systems. Junior chemist and chemical expert professions are regulated by statutory law.

professional skills:

SSCTA graduates are able to apply chemistry procedures and protocols, assist specialists in production quality control and maintenance of environmental quality, operation and safety standards of equipment, plants and technical systems.

career opportunities:

SSCTA graduates can serve as technical operators, namely as junior chemist, chemical technician, chemical laboratory technician, chemical analyst, chemical expert, chemical preparer.

### Workplace safety technicians

job function:

These professionals apply and execute procedures, regulations and technologies to adapt, modify, develop, control and verify the safety of workplaces and workers, machines and their methods of use.

professional skills:

SSCTA graduates are professionals who understand, analyse and apply knowledge in the field of workplace and worker safety.

career opportunities:

SSCTA graduates can work in prevention and protection services, including in managerial positions. They can operate laboratories of public and private entities, universities, research institutions.

### Environmental control and reclamation technicians

job function:

These professionals assist specialists in research and in the design, development and evaluation of systems for environmental control, protection and preservation.

professional skills:

SSCTA graduates are able to apply procedures to control and collect information on environmental pollution and its potential causes, adapting and operating adequate equipment; they apply procedures, regulations and technologies to monitor and ensure the efficiency of waste collection, selection, treatment and disposal; they are able to assess and implement programmes for the reclamation and remediation of polluted areas.

career opportunities:

SSCTA graduates can work as environmental monitoring technicians, water monitoring technicians, air monitoring technicians, environmental impact and safety technicians in the industry. They are able to operate laboratories of public and private facilities, universities, research institutions, or work in toxicological and environmental study and detection centres.

Biochemical laboratory technicians

job function:

These professions require technical specialist knowledge to select and apply predefined protocols and procedures in production or service activities. Their tasks are to assist specialists in the scientific, health, humanistic, economic and social fields, in quantitative physical, chemical, engineering and natural sciences, life sciences and health sciences.

professional skills:

SSCTA graduates are able to carry out activities related to the application and execution of scientific protocols relating to human health care and animal and plant production. They are able to verify and control the application of safety standards in public and work environments. They may assist veterinarians and agronomists in the care and production of animals and plants, apply and carry out scientific protocols in medical analysis laboratories and in agronomic and veterinary laboratories.

career opportunities:

SSCTA graduates can carry out laboratory activities, namely tests and analysis aimed at verifying and evaluating the chemical, physical and biological composition of water, natural or industrial products, the diagnosis of animal and plant diseases and research in the agronomic and zootechnical fields. They can operate laboratories of public and private entities, universities, research institutions, NHS facilities.

Food technicians

job function:

These professions require technical specialist knowledge to select and apply predefined protocols and procedures in production or service activities. Their tasks are to assist specialists in the scientific and health fields; to supervise, control, plan and ensure the proper functioning of production processes.

professional skills:

SSCTA graduates are professionals prepared to assist specialists, conduct quality tests and analyses on human and animal nutrition products, certify their quality, genetic sourcing and production technology, improve food processing and production chains.

career opportunities:

SSCTA graduates can work as laboratory technicians in the field of plant and animal biotechnology, oenology, commodities, laboratory technicians in the food and biofood field, quality control technicians in the food industry.

## **Initial knowledge required**

Admission requirements

Applicants to the programme must hold an upper secondary-school diploma or equivalent foreign qualification pursuant to Ministerial Decree no. 270 of 22 October 2004.

Admission requirements are adequate knowledge and skills to successfully attend the programme, including a good understanding of basic calculus, mastering the main laws of mechanical physics, basic knowledge of cell biology and general chemistry, logic skills, sound oral and written expression skills, good general knowledge.

Admission assessment

Admission into the programme is capped in order to meet high-quality teaching standards relative to available resources. There are 60 places available for enrolment in the first year, plus 5 places for non-EU students residing abroad. Admission is subject to a compulsory online test (TOLC-S by CISIA, the Consortium of Inter-University Integrated Access Systems). For test structure and topics, visit the page: <https://www.cisiaonline.it/area-tematica-tolc-scienze/struttura-della-prova-e-syllabus/>. You may apply for the TOLC test at the University of Milan or any other member university of CISIA. The schedule of TOLC-S tests organized by our and other Italian universities is available at: <https://tolc.cisiaonline.it/calendario.php>.

Admission requirements are assessed through the selection test and will be met by candidates achieving the minimum score set out in the call for applications available at <https://scta.cdl.unimi.it/it/iscriversi>. Candidates who take the TOLC-S test and apply for admission to the degree programme in Chemical Safety and Toxicological Environmental Sciences will be included in a merit ranking based on the test score. Those students who rank in the available positions may enrol in compliance with the deadlines set out in the call for applications; visit the page <https://www.unimi.it/it/studiare/frequentare-un-corso-di-laurea/iscriversi/iscriversi-una-prima-laurea>

Additional learning requirements (OFA) and remedial activities

Mathematics OFA. Students who have obtained a score equal to or lower than 10 in the basic mathematics module of the TOLC-S test will have to meet additional learning requirements (OFA). Students with additional learning requirements will

have to carry out remedial activities organised by the University in the period October-December, and then take a test to prove they have filled their gaps. Otherwise, they cannot take any second-year exams before passing the Mathematics and Statistics exam. Learn more at <https://scta.cdl.unimi.it/it/studiare/le-matricole>.

#### English OFA. Additional Learning Requirements (OFA) B1

In order to fulfil the Additional Learning Requirement (Obbligo Formativo Aggiuntivo – OFA) for English and sit the English-language exam required by the study plan, students must achieve B1 proficiency per the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B1 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>;
- By taking a placement test offered by the University Language Centre (SLAM) between October and December of the first year. Students 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 attesting to B1, B2, or higher level.

Those who have not taken the placement test by the end of December or fail the end-of-course exam six times must obtain the necessary certification privately in order to fulfil the OFA and sit the English exam.

#### Admission of transfer or graduate students

Transfer students from a degree programme of the University of Milan, or another university, and graduate students will be waived from the test only if admitted to years subsequent to the first. To this end, they will have to submit a specific request for prior assessment of their academic career using the online service indicated in the call for applications. These candidates must provide a full transcript of records (listing exams, subject areas, credits, grades) and attach the course syllabi. For more details, please refer to the call for applications.

Students admitted to the first year will be required to take the test and register for the call.

#### Compulsory attendance

Course attendance is compulsory, but there are tailored tracks for part-time students.

For further information visit the page: <https://www.unimi.it/en/study/bachelor-and-master-study/fees-and-how-pay-them/part-time-enrolment> and the degree programme website <https://scta.cdl.unimi.it/it>.

#### Student workers

Student workers enrolling on a part-time basis should agree with teachers how to attend lectures and laboratories. Student workers who do not enrol on a part-time basis must define a tailored track with each teacher, who can waive partially/fully from course attendance. If the student works in laboratories using the same techniques as the programme laboratories, they may be partially/fully waived by the teachers from laboratory attendance (each teacher must be contacted).

To take advantage of these exemptions, the student must submit a certificate stating their employment contract and working hours to the academic office (via Golgi) at the beginning of the year.

#### Internship criteria

The student must compulsorily carry out a practical internship period of not less than 6 months in industries, public structures and public or private research laboratories, after which 6 credits will be credited. The internship is expected to start when two exams are missing from the completion of the student's educational program; in the event that the start occurs with 3 or 4 missing exams, the internship will be extended to 8 and 10 months, respectively. Agreements with the structures hosting the trainees are stipulated by the degree course through COSP.

#### Degree programme final exams

The degree in SSCTA is achieved by passing a final exam. To be admitted to the final exam, the student must have achieved the required credits, by passing the exam tests or other forms of verification provided for in the didactic regulations (177 credits). This test involves the preparation of a thesis describing the experimental activity carried out by the student during the training period under the guidance of the training tutor and the supervision of an academic teacher. In the final exam, which is an individual formative moment to complete the course, the student illustrates and discusses his experimental activity. The final exam can be taken in English and the final paper can be presented in the same language.

#### Campus

Classes take place in the location indicated in the University teaching plan.

#### Laboratories

The structures in which the laboratory activities are carried out are communicated by the teachers in advance.

#### Notes

Additional Learning Requirements (OFA) B1. In order to fulfil the Additional Learning Requirement (Obbligo Formativo Aggiuntivo - OFA) for English and sit the English-language exam required by the study plan, students must achieve B1 proficiency per the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B1 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/39322>. The certificate must be uploaded during the enrolment procedure, or subsequently to the portal <http://studente.unimi.it/uploadCertificazioniLingue>;

- By taking a placement test offered by the University Language Centre (SLAM) between October and December of the first year. Students 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 attesting to B1 or higher level.

Those who have not taken the placement test by the end of December or fail the end-of-course exam six times must obtain the necessary certification privately in order to fulfil the OFA and sit the English exam.

## **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**

The course in Chemical-Toxicological and Environmental Safety Sciences (SSCTA) offers to its students the possibility to spend periods of study and training abroad using international programs of mobility and exchange; among them, the most important program is Erasmus+. The experience abroad is considered by the teachers of the course as a unique opportunity for the students to acquire personal experiences and professional skills.

The Universities hosting SSCTA students are at the moment located in Romania (Transilvania University of Brasov); Spain (Universities of Madrid and Granada), and Slovenia (University of Ljubljana).

The mobility is aimed to acquire credits (attending courses) and/or work in a training program, which can be used to prepare the final thesis

The universities involved in the exchanges offer activities in the area of biochemistry, pharmacology, and analytical methods (including both traditional and novel approaches).

Each student has a tutor, selected among the SSCTA teachers. All information about international mobility is reported at <https://www.unimi.it/en/education/chemical-safety-and-toxicological-environmental-sciences>.

Reward for the period spent abroad:

According to the period spent abroad, each student must prepare a suitable Learning Agreement in term of credits:

- An academic year: 60 credits;
- An academic semester: 30 credits;
- A three-months period: 20 CFU

The students must obtain at least 70% of credits established in the Learning Agreement. For students spending a training period abroad, the student must obtain all credits reported in the Learning Agreement.

For the students, who finalize positively their training period, a reward is planned at the end of the academic carrier. Extra marks, ranging between 1 and 3 (according to the period spent abroad, the number of credits obtained, and the value of the whole experience), are added to the final grade taking into consideration the tutor's proposal.

### **How to participate in Erasmus mobility programs**

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](mailto:mobility.out@unimi.it)  
 Student Desk booking through InformaStudenti

<b>1st COURSE YEAR (disactivated from academic year 2024/25) Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Analytical chemistry	8	CHIM/01
Calculus and Statistics	6	MAT/07
General Chemistry	8	CHIM/03
Human Anatomy and General Biology	12	(4) BIO/16, (8) BIO/13
Organic Chemistry	8	CHIM/06
Physics and Informatics	9	(4) INF/01, (5) FIS/01
Scientific English	3	L-LIN/12
Total compulsory credits		54
<b>2nd COURSE YEAR Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Biochemistry	8	BIO/10
Chemical and Toxicological Analysis 1	11	CHIM/08
Environmental chemistry	8	CHIM/12, CHIM/06
General Pathology	6	MED/04
Microbiology and Hygiene	8	BIO/19
Pharmacology 1 and Pharmacology 2	8	BIO/14
Physiology	6	BIO/09
Toxicology I	8	BIO/14
Total compulsory credits		63
<b>3rd COURSE YEAR Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Biotechnology 1 and Biotechnology 2	8	BIO/14
Chemical and Toxicological Analysis 2	11	CHIM/08
Food Chemistry	10	CHIM/10
Technology and Pharmaceutical Legislation and Toxicology II	13	(10) BIO/14, (3) CHIM/09
Total compulsory credits		42
<b>Further elective courses</b>		
<p><b>The student must acquire 12 CFUs in elective educational activities. For this purpose, the degree program makes available the teachings listed below, which are normally held in the first semester. Any semester changes will be promptly communicated. The recommended year of the course to successfully follow the teaching and take the exam is specified next to each course. Upon approval of the study plan, students may include, among the elective educational activities, teachings related to transversal skills, provided by other degree programs of the University.</b></p>		
Analysis of pesticides and contaminants in food and environmental matrices	4	CHIM/10
Biochemistry of the environment and pollution	4	BIO/10
Environmental impact assessment	4	ICAR/03
Environmental toxicology	4	BIO/14
Epidemiology and occupational toxicology	4	BIO/14
Pharmacological activities of substances of natural origin	4	BIO/14
Pollution and Environmental Safety	4	BIO/14
Study of the mechanism of action of toxicants in the environment	4	BIO/14
The effect of endocrine disruptors on health	4	MED/13
Training job-support	4	BIO/14
<b>End of course requirements</b>		
Final exam	3	NA
Stage	6	NA
Total compulsory credits		9

## COURSE PROGRESSION REQUIREMENTS

The acquisition of credits related to Analytical Chemistry is a prerequisite to the practical activities (laboratory) of Chemical and Toxicological Analysis 1.

The acquisition of credits related to Organic Chemistry is a prerequisite to the practical activities (laboratory) of Chemical and Toxicological Analysis 2.

Learning activity	Prescribed foundation courses	O/S
General Pathology	Human Anatomy and General Biology	Core/compulsory
Microbiology and Hygiene	General Chemistry	Core/compulsory
	Human Anatomy and General Biology	Core/compulsory
Toxicology I	Human Anatomy and General Biology	Core/compulsory
Physiology	Physics and Informatics	Core/compulsory
	General Chemistry	Core/compulsory
	Human Anatomy and General Biology	Core/compulsory
Pharmacology 1 and Pharmacology 2	Human Anatomy and General Biology	Core/compulsory
Environmental chemistry	Organic Chemistry	Core/compulsory
	Physics and Informatics	Core/compulsory
	General Chemistry	Core/compulsory
Biochemistry	Organic Chemistry	Core/compulsory
	General Chemistry	Core/compulsory
	Human Anatomy and General Biology	Core/compulsory
Chemical and Toxicological Analysis 1	Analytical chemistry	Core/compulsory
	Physics and Informatics	Core/compulsory
	General Chemistry	Core/compulsory
Chemical and Toxicological Analysis 2	Chemical and Toxicological Analysis 1	Core/compulsory
	Organic Chemistry	Core/compulsory
Technology and Pharmaceutical Legislation and Toxicology II	Toxicology I	Core/compulsory
Food Chemistry	Biochemistry	Core/compulsory
	Chemical and Toxicological Analysis 1	Core/compulsory
Biotechnology 1 and Biotechnology 2	Pharmacology 1 and Pharmacology 2	Core/compulsory
	Biochemistry	Core/compulsory
Organic Chemistry	General Chemistry	Core/compulsory
Analytical chemistry	General Chemistry	Core/compulsory