



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2015/16
SINGLE-CYCLE DEGREE
Pharmaceutical Chemistry and Technology (Classe LM-13)
Enrolled from 2009/2010 academic year

HEADING

Degree classification - Denomination and code:	LM-13 Pharmacy and industrial pharmacy
Degree title:	Dottore Magistrale
Length of course:	5 years
Total number of credits required to complete programme:	300
Years of course currently available:	1st , 2nd , 3rd , 4th , 5th
Access procedures:	Cap on student, student selection based on entrance test
Course code:	E25

PERSONS/ROLES

Head of Interdepartmental Study Programme

Prof.ssa Maria Luisa Gelmi

Tutors - Faculty

I ANNO

Ad ogni studente del I anno verrà assegnato un tutor che lo seguirà nel suo percorso di studio fino alla laurea.
La lista dei docenti tutor verrà pubblicata sul sito di Facoltà all'inizio dell'anno accademico.

II ANNO

Prof.ssa Donatella Caruso
Prof. Concetta La Rosa
Prof. Giancarlo Aldini
Prof. Giulio Vistoli

III ANNO

Prof.ssa Daniela Barlocco
Prof.ssa Maria Luisa Gelmi
Prof. Alberto Corsini
Prof.ssa Egle Beccalli

IV ANNO

Prof. Sergio Romeo
Prof. Carlo De Micheli
Prof. Marco Pallavicini
Prof. Anna Petroni

STUDENTI STRANIERI

Prof. R.C. Melcangi, roberto.melcangi@unimi.it

STUDENTI DISABILI

Prof. Gianenrico Rovati, genrico.rovati@unimi.it

STUDENTI IN TIROCINIO

Prof.ssa P. Minghetti, paola.minghetti@unimi.it

Degree Course website

www.farmacia.unimi.it

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<http://www.unimi.it/studenti/matricole/77598.htm>

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CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The Master Course in Pharmaceutical Chemistry and Technology aims to train students in chemical, pharmacological, technological and regulatory fields useful to work in positions of responsibility and coordination in all sectors directly or indirectly related to research and discovery, development, production, quality assurance and marketing of drugs and healthy products.

The course trains for the profession as community and hospital pharmacist as well as for medical information (REP). In particular, the course aims to train professionals able to satisfy the needs and requests of the pharmaceutical, cosmetics, medical devices and food supplements industry, as well as the requests of public and private institutions involved in health research and regulation.

Therefore, such a multidisciplinary degree aims to provide:

- 1) a preparation on the basic sciences (mathematical, physical, chemical, biological, medical sciences) necessary to acquire solid theoretical and practical skills to support specific disciplines characterizing the course
- 2) knowledge on medicinal chemistry, biochemistry and pharmacology to allow the design and development of novel biologically active molecules
- 3) knowledge on pharmaceutical technology to allow the design, the development and the quality control of drug dosage forms and healthy products.
- 4) knowledge of national and international legislation regarding drugs and healthy products;
- 5) operational skills, needed to address researches in the fields characterizing the degree course, through educational activities related to the thesis;
- 6) useful knowledge to carry out professional pharmaceutical services under the National Health Service through the practical training activity, according to 85/432 / EEC law.

Acquired skills and competences

The Course in Pharmaceutical Chemistry and Technology allows the acquisition of the following skills for different professional activities:

- 1) discovery, synthesis and production of novel biologically active molecules
- 2) Formulation, production and quality control for drug
- 3) Formulation, production and quality control for dietetic foods
- 4) Formulation, production and quality control for cosmetic products
- 5) Microbiological and physicochemical analyses for mineral waters
- 6) Handling, storage of drugs during the wholesale stage
- 7) Preparation, quality control, storage and distribution of drugs in pharmacies and hospitals
- 8) Dissemination of information and advices concerning health products

Professional profile and employment opportunities

Graduates in Pharmaceutical Chemistry and Technology possess the scientific and theoretical expertise to operate as experts in the field of drug and healthy products (foods for special medical purposes and special diets, cosmetics, herbal, diagnostic, medical devices, etc.) and in related fields and to take on the professional role of pharmacist.

The course trains students for the following professions:

- Medicinal Chemist
- Pharmacist and similar professions
- Chemistry and pharmaceutical Company representative
- Pharmacologist
- Regulatory affairs
- Drug safety
- Clinical research marketing and sales support
- Education and training

Notes

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EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports the international mobility of its students, offering them the opportunity to spend periods of study and training abroad, a unique opportunity to enrich their curriculum in an international context.

Study and internships abroad

Programs offered:

- Erasmus + Placement Programme, and Erasmus Mundus + at Universities/Institutions partners in Europe and in the Balkans;
- stages at i) Departments of Medicine and Pharmacology, University of Minnesota US; ii) Institute of Advanced Energy, Kyoto University, Japan

Activities: the mobility is directed to attending courses, research internships and training in Hospital Pharmacy.

The Erasmus Programme + Placement offers the opportunity to play an internship abroad in enterprises or other organizations.

Universities and partner Companies offer the opportunity to carry out researches in a wide range of scientific topics characterizing the Course of Study. For detailed informations on the host institution and fields of studies, see the following web site: http://www.farmacia.unimi.it/CorsiDiLaurea/3125_ITA_HTML.html.

Procedure for the recognition of abroad studies. Every student must define the activity and the number of CFU in his/her Learning Agreement according to the following rules:

-an academic year: 60 credits;

-an academic semester: 30 credits;

-an academic quarter: 20 CFU.

-Internship in Hospital pharmacy could not be longer than for 4-months corresponding to 20 CFU. This activity follows the rules of the prerequisites reported in the Manifesto.

Recognition of the abroad studies: students must acquire at least 70% of the credits specified in the Learning Agreement. For thesis/internship researches, the student must acquire all the credits reported in the Learning Agreement.

Incentives: An additional score (1-3 points depending on the duration of the study period, the amount of credits attained and the obtained results) will be proposed by the tutor and awarded by the thesis committee to the students who have satisfactorily accomplished the training program.

How to participate in Erasmus mobility programs

To gain access to mobility programs for study purposes, lasting 3-12 months, the enrolled students of the University of Milan must attend a public selection that starts usually around the month of February each year through the presentation of specific competition announcements, which contain information on available destinations, respective duration of the mobility, requirements and deadlines for submitting the online application.

The selection, aimed at evaluating the proposed study abroad program of the candidate, knowledge of a foreign language, especially when this is a preferential requirement, and the motivations behind the request, is performed by specially constituted commissions.

Each year, before the expiry of the competition announcements, the University organises information sessions for the specific study course or groups of study courses, in order to illustrate to students the opportunities and participation rules.

To finance stays abroad under the Erasmus + program, the European Union assigns to the selected students a scholarship that - while not covering the full cost of living abroad - is a useful contribution for additional costs as travel costs or greater cost of living in the country of destination.

The monthly amount of the communitarian scholarship is established annually at national level; additional contributions may be provided to students with disabilities.

In order to enable students in economic disadvantaged conditions to participate in Erasmus+ program, the University of Milan assigns further additional contributions; amount of this contributions and criteria for assigning them are established from year to year.

The University of Milan promotes the linguistic preparation of students selected for mobility programs, organising every year intensive courses in the following languages: English, French, German and Spanish.

The University in order to facilitate the organisation of the stay abroad and to guide students in choosing their destination offers a specific support service.

More information in Italian are available on www.unimi.it > Studenti > Studiare all'estero > Erasmus+

For assistance please contact:

Ufficio Accordi e relazioni internazionali

via Festa del Perdono 7 (ground floor)

Tel. 02 503 13501-12589-13495-13502

Fax 02 503 13503

E-mail: mobility.out@unimi.it

Desk opening hour: Monday-friday 9 - 12

1st COURSE YEAR Core/compulsory courses/activities common				
Distribution	Learning activity	Teaching units/modules	Ects	Sector
annuale	Chimica generale, inorganica e stechiometria		10	CHIM/03
annuale	Anatomia umana e Fisiologia (tot. credits: 11)	Human Anatomy (1 semestre)	5	BIO/09, BIO/16
		Physiology (2 semestre)	6	BIO/09, BIO/16
1 semestre	Biologia animale e Biologia vegetale (tot. credits: 9)	Animal Biology	6	BIO/13, BIO/15
		Plant Biology	3	BIO/13, BIO/15
1 semestre	Matematica		7	MAT/05
2 semestre	Chimica analitica		6	CHIM/01
2 semestre	Abilità informatiche		3	INF/01
2 semestre	Lingua inglese		2	L-LIN/02
2 semestre	Fisica (E25)		8	FIS/01
		Total compulsory credits	56	
2nd COURSE YEAR Core/compulsory courses/activities common				
Distribution	Learning activity	Teaching units/modules	Ects	Sector
1 semestre	Microbiologia applicata		6	BIO/19
1 semestre	Chimica organica 1		10	CHIM/06
1 semestre	Chimica fisica		6	CHIM/02
1 semestre	Analisi dei medicinali e Lab. di Analisi dei medicinali (tot. credits: 6)	(1 semestre)	3	CHIM/08
		(1 semestre)	3	CHIM/08
2 semestre	Biochimica		8	BIO/10
2 semestre	Analisi dei Farmaci 1 e Lab. di Analisi dei Farmaci 1 e Analisi degli alimenti speciali (tot. credits: 12)	DRUG ANALYSIS 1 (2 semestre)	6	CHIM/08, CHIM/10
		LABORATORY OF DRUG ANALYSIS 2 (2 semestre)	3	CHIM/08, CHIM/10
		ANALYSIS OF SPECIAL FOODS (2 semestre)	3	CHIM/08, CHIM/10
2 semestre	Patologia generale		6	MED/04
2 semestre	Farmacognosia		8	BIO/15
		Total compulsory credits	62	
3rd COURSE YEAR Core/compulsory courses/activities common				
Distribution	Learning activity	Teaching units/modules	Ects	Sector
1 semestre	Biochimica applicata		8	BIO/10
1 semestre	Chimica Organica 2 e Lab. di Chimica Organica (tot. credits: 10)	Organic Chemistry 2 (1 semestre)	6	CHIM/06
		Organic Chemistry Laboratory (1 semestre)	4	CHIM/06
1 semestre	Farmacologia e farmacoterapia		8	BIO/14
2 semestre	Preparazioni estrattive e sintetiche dei farmaci e Laboratorio di preparazioni estrattive e sintetiche dei farmaci (tot. credits: 6)	Extractive and Synthetic Preparation of Drugs (2 semestre)	3	CHIM/08
		Laboratory of Extractive and Synthetic Preparation of Drugs (2 semestre)	3	CHIM/08
2 semestre	Chimica farmaceutica e tossicologica 1		10	CHIM/08
2 semestre	Metodi fisici in chimica organica		7	CHIM/06
2 semestre	Tossicologia		8	BIO/14
		Total compulsory credits	57	
4th COURSE YEAR Core/compulsory courses/activities common				
Distribution	Learning activity	Teaching units/modules	Ects	Sector
1 semestre	Analisi dei Farmaci 2 e Lab. di Analisi dei Farmaci II (tot. credits: 10)	DRUG ANALYSIS 2 (1 semestre)	6	CHIM/08
		LABORATORY OF DRUG ANALYSIS 2 (1 semestre)	4	CHIM/08
1 semestre	Chimica farmaceutica e tossicologica 2		10	CHIM/08
1 semestre	Tecnologia e Legislazione Farmaceutiche I		9	CHIM/09
2 semestre	Tecnologia e Legislazione Farmaceutiche II		9	CHIM/09
		Total compulsory credits	38	
Activites chosen by the student				
a) Science of drug development profile				
2 semestre	Metodologie avanzate in chimica farmaceutica (moduli I e II) (tot. credits: 8)	Advanced methodologies in Medicinal Chemistry I (2 semestre)	4	CHIM/08

		Advanced methodologies in Medicinal Chemistry II (2 semestre)	4	CHIM/08
2 semestre	Metodol. anal. nella progettaz. e nello svil.del farmaco e Analisi strument. e proc. di convalida nell'ind.farmaceutic (tot. credits: 8)	Analytical methods in drug discovery and development (2 semestre)	4	CHIM/08
		Instrumental analysis and validation of the analytical procedures in pharmaceutical industry (2 semestre)	4	CHIM/08
b) Pharmaceuticals and pharmaceutical technology profile				
2 semestre	Tecnologie farmaceutiche innovative (moduli I e II) (tot. credits: 8)	Advances in Drug Delivery Systems Mod. I (2 semestre)	4	CHIM/09
		Advances in Drug Delivery Systems Mod. II (2 semestre)	4	CHIM/09
2 semestre	Aspetti tecnologici e normativi dei prod. dell'area salutare e Normativa relativa all'AIC ed ai brevetti dei medicinal (tot. credits: 8)	Formulation and Regulatory Affairs of Health Products	4	CHIM/09
		Pharmaceutical Regulatory Affairs and Patents	4	CHIM/09
c) Experimental pharmacology profile				
2 semestre	Farmacologia cellulare e molecolare e Farmacologia sperimentale (tot. credits: 8)	Molecular and Cellular Pharmacology (2 semestre)	4	BIO/14
		Experimental Pharmacology (2 semestre)	4	BIO/14
2 semestre	Biotecnologie farmacologiche e Biologia molecolare (tot. credits: 8)	Pharmacological in biotechnology (2 semestre)	4	BIO/14
		Molecular Biology (2 semestre)	4	BIO/11
d) Pharmacological and therapeutic profile				
2 semestre	Farmaco-tossicologia di farmaci biotecnologici e Normativa relativa all'AIC ed ai brevetti dei medicinali (tot. credits: 8)	Biotechnological drugs: pharmaco-toxicological aspects (2 semestre)	4	BIO/14
		Pharmaceutical Regulatory Affairs and Patents (2 semestre)	4	CHIM/09
2 semestre	Farmacologia clinica e Farmacoeconomia e farmacoepidemiologia (tot. credits: 8)	Clinical pharmacology (2 semestre)	4	BIO/14
		Pharmacoepidemiology and Pharmacoeconomics (2 semestre)	4	BIO/14
e) Molecular and supramolecular chemistry: analysis and synthesis profile				
2 semestre	Nanoparticelle inorganiche nelle scienze della vita e metodologie di caratterizzazione avanzate (tot. credits: 8)	(2 semestre)	4	CHIM/03
		(2 semestre)	4	CHIM/06
2 semestre	Chimica metallorganica e applicazioni in chimica fine (tot. credits: 8)	(2 semestre)	4	CHIM/03
		(2 semestre)	4	CHIM/06
f) Chemical methods applied to biomolecules profile				
2 semestre	Metodologie innovative di sintesi e di analisi (moduli I e II) (tot. credits: 8)	(2 semestre)	4	CHIM/06
		(2 semestre)	4	CHIM/06
2 semestre	Aspetti sintetici nella preparazione di biomolecole e Biomolecole applicate allo studio di sistemi biologici (tot. credits: 8)	Synthetic Aspects in Biomolecules Preparation	4	CHIM/06
		Application of biomolecules in biological systems studies	4	BIO/10
g) Endocrinology and metabolism profile				
2 semestre	Endocrinologia e metabolismo (tot. credits: 8)	(2 semestre)	4	MED/13
		(2 semestre)	4	MED/13
2 semestre	Esigenze nutrizionali nel corso della vita e Aspetti patologici della nutrizione (tot. credits: 8)	Nutritional requirement during lifetime (2 semestre)	5	BIO/09
		Pathological aspects of nutrition (2 semestre)	3	MED/05
Nei profili professionalizzanti potranno, in alternativa, essere utilizzati i seguenti insegnamenti: (tradurre)				
2 semestre	Bioetica		4	MED/02
2 semestre	Biochimica clinica e biologia molecolare clinica		4	BIO/12
2 semestre	Chimica e biotecnologia delle fermentazioni		4	CHIM/11
2 semestre	Organizzazione aziendale		4	SECS-P/10
2 semestre	Statistica per la ricerca sperimentale e tecnologica		4	SECS-S/02
5th COURSE YEAR Core/compulsory courses/activities common				
Distribution	Learning activity	Teaching units/modules	Ects	Sector
1 semestre	Fabbricazione industriale dei medicinali e Laboratorio di Tecnologia Farmaceutica (tot. credits: 8)	Industrial Pharmacy (1 semestre)	4	CHIM/09
		Laboratory of Pharmaceutical Technology (1 semestre)	4	CHIM/09
		Total compulsory credits	8	
Activites chosen by the student				
Lo studente dovrà scegliere un insegnamento, del valore di otto crediti, o due insegnamenti, ciascuno del valore di quattro crediti, tra quelli di seguito elencati. Gli insegnamenti a scelta libera saranno attivati sulla base delle richieste degli studenti. Le eventuali propedeuticità saranno indicate dai docenti titolari dei corsi. (tradurre)				
	Analisi dei principi attivi in matrici complesse e Drug master file (tot. credits: 8)		4	CHIM/08
			4	CHIM/08
	Terapie biologiche (tot. credits: 8)		4	BIO/14
			4	BIO/14
	Biomarcatori ed esami di laboratorio (tot. credits: 8)	Clinical biochemistry	4	BIO/12

		technologies		
		Clinical assessment of biomarkers and laboratory tests	4	MED/05
	Biosintesi di sostanze organiche naturali e Biocatalisi applicata alla sintesi organica (tot. credits: 8)		4	CHIM/06
			4	CHIM/06
	Farmaci biotecnologici e Preparazione industriale di farmaci da precursori di origine fermentativa o estrattiva (tot. credits: 8)		4	CHIM/08
			4	CHIM/08
	Prodotti cosmetici (tot. credits: 8)		4	CHIM/09
			4	CHIM/09
	Integratori alimentari, alimenti funzionali e novel food		8	CHIM/10
	Laboratorio sperimentale		8	
	Prodotti salutari e Dispositivi medici (tot. credits: 8)		4	CHIM/09
			4	CHIM/09
	Chimica dei composti eterociclici e Applicazioni di catalisi metallorganica (tot. credits: 8)		4	CHIM/06
			4	CHIM/03
	Farmaci innovativi e Radiofarmaci (tot. credits: 8)	Innovative drugs	4	CHIM/08
		Radiopharmaceuticals	4	CHIM/08
	Approcci molecolari innovativi per l'identificazione di bersagli farmacologici (tot. credits: 8)	Molecular biology applied to the study of new druggable targets	4	BIO/10
		Current proteomic technologies	4	BIO/10
	Aspetti di economia e marketing dei medicinali e medicinali generici (tot. credits: 8)	Introduction to Economics and Marketing of Drug Products	4	CHIM/09
		Generic drug products	4	CHIM/09
	Chimica metallorganica e Metallorganica e catalisi stereocontrollata (tot. credits: 8)		4	CHIM/03
			4	CHIM/03
	Metodologie e modelli sperimentali per l'utilizzo terapeutico degli ormoni (tot. credits: 8)		4	MED/13
			4	BIO/13
	Stereochimica farmaceutica e Impiego di metodologie informatiche nella progettazione di farmaci (tot. credits: 8)		4	CHIM/08
			4	CHIM/08
	Fisiologia dei sistemi integrati I (tot. credits: 8)	Module I	4	BIO/09
		Module II	4	BIO/09
	Chimica dei recettori e Nanotecnologie farmaceutiche (tot. credits: 8)		4	CHIM/08
			4	CHIM/08
	Farmacologia speciale (tot. credits: 8)		4	BIO/14
			4	BIO/14
Final learning activities				
	Attività formativa relativa alla preparazione della prova finale (quinto anno)		21	
	Attività formativa relativa alla preparazione della prova finale (quarto anno)		4	
	Tirocinio in farmacia (prima parte)		5	
	Tirocinio in farmacia (seconda parte)		25	
		Total compulsory credits	55	

COURSE PROGRESSION REQUIREMENTS

The course contains the following obligatory or advised prerequisites

Learning activity	Prescribed foundation courses	O/S
Spectroscopic methods in organic chemistry	Organic Chemistry1	Core/compulsory
Applied Microbiology	Human Anatomy and Physiology	Core/compulsory
	Animal Biology and Plant Biology	Core/compulsory
General Pathology	Human Anatomy and Physiology	Core/compulsory
	Animal Biology and Plant Biology	Core/compulsory
QUALITATIVE ANALYSIS OF INORGANIC DRUGS	ANALYTICAL CHEMISTRY	Core/compulsory
DRUG ANALYSIS 1 AND LABORATORY OF DRUG ANALYSIS 1 AND ANALYSIS OF SPECIAL FOODS	ANALYTICAL CHEMISTRY	Core/compulsory
	Organic Chemistry1	Recommended
DRUG ANALYSIS 2 AND LABORATORY OF DRUG ANALYSIS 2	DRUG ANALYSIS 1 AND LABORATORY OF DRUG ANALYSIS 1 AND ANALYSIS OF SPECIAL FOODS	Core/compulsory
Medicinal Chemistry 1	Organic Chemistry1	Core/compulsory
Medicinal Chemistry 2	Medicinal Chemistry 1	Core/compulsory
Extractive and Synthetic Preparation of Drugs and Laboratory of Extractive and Synthetic Preparation of Drugs	Organic Chemistry1	Core/compulsory
Pharmaceutical Technology and Legislation I	DRUG ANALYSIS 1 AND LABORATORY OF DRUG ANALYSIS 1 AND ANALYSIS OF SPECIAL FOODS	Core/compulsory
	Physics	Core/compulsory
	Organic Chemistry1	Core/compulsory
	PHARMACOLOGY AND PHARMACOTHERAPY	Core/compulsory
Pharmaceutical Technology and Legislation II	DRUG ANALYSIS 1 AND LABORATORY OF DRUG ANALYSIS 1 AND ANALYSIS OF SPECIAL FOODS	Core/compulsory
	Pharmaceutical Technology and Legislation I	Recommended
	Physics	Core/compulsory
	Organic Chemistry1	Core/compulsory
	PHARMACOLOGY AND PHARMACOTHERAPY	Core/compulsory

Industrial Pharmacy and Laboratory of Pharmaceutical Technology	Pharmaceutical Technology and Legislation I	Core/compulsory
Biochemistry	Human Anatomy and Physiology	Core/compulsory
	Organic Chemistry1	Recommended
Physics	Calculus	Recommended
Human Anatomy and Physiology	Animal Biology and Plant Biology	Recommended
Toxicology	PHARMACOGNOSY	Core/compulsory
PHARMACOGNOSY	Human Anatomy and Physiology	Core/compulsory
	Animal Biology and Plant Biology	Core/compulsory
Applied Biochemistry	Biochemistry	Core/compulsory
	Organic Chemistry1	Core/compulsory
ANALYTICAL CHEMISTRY	General and Inorganic Chemistry and Stoichiometry	Recommended
Organic Chemistry1	General and Inorganic Chemistry and Stoichiometry	Core/compulsory
PHARMACOLOGY AND PHARMACOTHERAPY	General Pathology	Core/compulsory
	Biochemistry	Core/compulsory
	PHARMACOGNOSY	Core/compulsory
PHYSICAL CHEMISTRY	General and Inorganic Chemistry and Stoichiometry	Core/compulsory