



# UNIVERSITÀ DEGLI STUDI DI PALERMO

Department: Biological, Chemical and Pharmaceutical Sciences and Technologies

A.Y. 2019/2020

## DEGREE COURSE IN CHEMISTRY AND PHARMACEUTICAL TECHNOLOGIES - PHARMACEUTICAL CHEMISTRY AND TECHNOLOGIES -

### Characteristics



Class of Master's Degree  
(MSc) on Pharmacy and  
industrial pharmacy (LM-13)



5 YEARS



PALERMO



PLANNED ACCESS



2013

### Educational objectives

The single cycle five-year Degree course in Pharmaceutical Chemistry and Technologies (CTF) aims at training graduates possessing the necessary scientific groundings to work in the pharmaceutical industry and in healthcare industry at large. This course, in particular, provides advanced theoretical and practical training in all the areas of the multidisciplinary process starting from the design of potentially active molecules and bringing to the synthesis, experimentation, registration, production, control and marketing of drugs, in accordance with the rules of Italian and European Pharmacopoeias.

The Degree course also provides the training needed to carry out the professional practice of Pharmacist, at regional and hospital level, and, in general, of consultancy, drug promotion and distribution.

Graduates of this course, in accordance with the CE Directive 85/432, may take the qualification examination for the profession of pharmacist. The Single-cycle Degree in Pharmaceutical Chemistry and technologies also permits graduates to take the national examination for the registration to section A of the Professional Registrar of Chemists, in accordance with the Decree of the President of Republic n. 328, of 05/06/2001.

To achieve its educational objectives, the single cycle Degree Course in Pharmaceutical Chemistry and Technologies provides students with:

- 1) Solid groundings in core scientific (mathematical, physical, chemical, biological, medical) subjects, enabling them to a scientific approach to problem solving;
- 2) Advanced knowledge of the chemical and biological characteristics needed to design new biologically active molecules;
- 3) The capability of applying the acquired multidisciplinary scientific knowledge to the synthesis of new active ingredients;
- 4) The capability of developing and applying protocols for the quality control of drugs and healthcare products;
- 5) The capability of applying scientific and technological knowledge to the preparation and control of pharmaceutical formulae;
- 6) The knowledge of the national and supranational legislative frameworks relevant for the marketing of raw materials, drugs and healthcare products;
- 7) The necessary knowledge and learning skills to tackle PhD courses related to the relevant professions.

The structure of the first four years of the course provides students with a gradual and constant progression of their competence level.

The course consists of a single five-year cycle, with four years of full time theoretical and practical teaching. The fifth course year is mostly devoted to practical professional internships and to the preparation of the final dissertation.

The course provides:

- a) Core scientific and technological competences to be applied in drug dosage and identification, in purity tests and in the preparation of galenic drugs;
- b) The ability to apply the acquired knowledge to professional practice in a public pharmacy or hospital pharmacy, under specific agreements, with the guidance of a supervising pharmacist, for at least 6 months (30 credits).

The single-cycle Degree Course in Pharmaceutical Chemistry and Technologies, divided in curricula, also provides students with:

- Advanced methodological training providing the planning abilities and the chemical-pharmacological-technological knowledge needed to carry out research activities in universities as well as in public and private laboratories;
- The possibility of acquiring other useful knowledge with respect to the production, packaging, quality and stability control and to the evaluation of pharmaceutical products.

An adequate number of credits is given to each class specific scientific sector, both at theoretical and experimental level;

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credits are spread throughout various course years , thus providing graduates with advanced and complete knowledge and competences in the pharmaceutical sector.

### Professional opportunities

Profile:

Pharmacist, Chemist and similar professions, Researcher in Chemical and Pharmaceutical Sciences

Functions:

The graduate in CTF, after obtaining the qualification, can carry out according to the Directive 85/432 / CEE, the profession of Pharmacist and carry out the following connected professional activities:

- Preparation of the pharmaceutical form of medicines;
- Manufacturing and control of medicines;
- Control of medicines in the control laboratory;
- Storage, preservation and distribution of medicines at the wholesale stage;
- Preparation, control, storage and distribution of medicines in public and hospital;
- Dissemination of information and advice in the field of medicines and health protection.

The graduate in CTF is therefore a health professional who, in the context of his multidisciplinary skills (chemical, biological, pharmaceutical, pharmacological, toxicological and technological), contributes to the achievement of the objectives set by the National Health Service, to adequately respond to the changing needs of society with respect to health.

Furthermore, the achievement of the qualification to the Chemist profession, allows the graduate in CTF, according to the D.P.R. 5 June 2001 n. 328, registration in section A of the Professional Register of Chemists, for the pursuit of the following professional activities:

- Chemical analyses with any method and for any purpose;
- Management of chemical laboratories whose activity also consists of chemical analyses;
- Study and development of chemical processes;
- Design and implementation of chemical laboratories and industrial chemical plants;
- Hazard and danger assessment of chemical substances.

Skills:

The main objective of the one-cycle Master's Degree Course in Chemistry and Pharmaceutical Technology (CTF) is to provide graduates with the scientific groundings necessary to operate in the pharmaceutical industry and health products in general. In particular, the course provides advanced theoretical and practical training in every sector of the multidisciplinary process, starting from the design of potentially active molecules and leading to the synthesis, testing, recording, production, control and marketing of drugs according to the standards codified in the Italian and European Pharmacopoeias. The course also provides basic training to carry out the profession of pharmacist in a territorial and hospital context and more generally of counselling, information and distribution of the drug. To achieve these educational objectives, the course provide its graduates with: solid groundings in the disciplines of basic sciences (mathematical, physical, chemical, biological, medical) capable of guaranteeing a scientific approach to solving problems; an in-depth knowledge of the chemical and biological characteristics necessary for the design of new biologically active molecules; the ability to apply the multidisciplinary scientific knowledge acquired to the synthesis of new active ingredients; the ability to develop and apply protocols for quality control of drugs and health products; the ability to apply scientific and technological knowledge to the preparation and control of pharmaceutical formulations; knowledge of national and supranational legislative contexts useful for the marketing of raw materials, medicines and health products.

Professional opportunities:

Pharmacist in pharmacies open to the public.

Scientific Informer for Pharmaceutical Industries.

Qualified Person (Technical Director) in drug production facilities.

Researcher at public and private facilities.

Responsible for quality controls in Pharmaceutical Industries.

Analyst at chemical laboratories.

### Final examination features

It consists of the presentation and discussion of a written dissertation related to an experimental activity on an original monodisciplinary or multidisciplinary topic, carried out at a research laboratory involving a Professor of the Faculty or at other public or private facilities in accordance to specific agreements (experimental dissertation) The course educational regulations describe the rules for requesting a dissertation, for assigning a dissertation topic and for evaluating the dissertation. The original dissertation, prepared by the student under the guidance of a supervising professor is publicly discussed in front of a Board of Professors, and final mark will be awarded out of 110. The regulation of the final exam was approved by the Board of the Degree Course on February, 22, 2013 in accordance with the general scheme of the University and approved by Rector's decree. 469-2014 of 02/07/2014

| Subjects 1 ° year  | CFU | Sem. | Val. | SSD     | TAF |
|--|-----|------|------|---------|-----|
| 15545 - ANIMAL AND PLANT BIOLOGY<br><i>Romano(CU)</i>          | 8   | 1    | V    | BIO/13  | A   |
| 01900 - GENERAL AND INORGANIC CHEMISTRY<br><i>Girasolo(RU)</i> | 8   | 1    | V    | CHIM/03 | A   |

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| Subjects 1 ° year   | CFU | Sem. | Val. | SSD    | TAF |
|---|-----|------|------|--------|-----|
| 13167 - MATHEMATICS AND PHYSICS - INTEGRATED COURSE               | 16  | Ann. | V    |        |     |
| - MATHEMATICS<br><i>Bartolotta(PO)</i>                            | 8   | 1    |      | FIS/07 | A   |
| - PHYSICS<br><i>Bartolotta(PO)</i>                                | 8   | 2    |      | FIS/07 | A   |
| 01115 - COMPUTING SKILLS  | 4   | 1    | G    |        | F   |
| 20692 - ENGLISH LANGUAGE SKILLS - EQUIVALENT TO LEVEL B1          | 3   | 1    | G    |        | E   |
| 05213 - GENERAL MICROBIOLOGY<br><i>Schillaci(PO)</i>              | 6   | 2    | V    | BIO/19 | A   |
| 01286 - HUMAN ANATOMY<br><i>David(PA)</i>                         | 6   | 2    | V    | BIO/16 | A   |
| 03148 - PHARMACOLOGY AND PHARMACOGNOSIS<br><i>Labbozzetta(RU)</i> | 6   | 2    | V    | BIO/14 | B   |

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| Subjects 2 ° year  | CFU | Sem. | Val. | SSD     | TAF |
|--|-----|------|------|---------|-----|
| 01799 - ANALYTICAL CHEMISTRY<br><i>Bongiorno(PA)</i>                                   | 8   | 1    | V    | CHIM/01 | A   |
| 01933 - ORGANIC CHEMISTRY<br><i>Palumbo Piccionello(PA)</i>                            | 10  | 1    | V    | CHIM/06 | A   |
| 01211 - PHARMACEUTICAL ANALYSIS OF DRUGS<br><i>Barraja(PO) [A-L], Spano'(PA) [M-Z]</i> | 10  | 1    | V    | CHIM/08 | B   |
| 20691 - ENGLISH LANGUAGE SKILLS - EQUIVALENT TO LEVEL B2                               | 3   | 1    | G    |         | E   |
| 01542 - BIOCHEMISTRY<br><i>Allegra(PO)</i>   | 10  | 2    | V    | BIO/10  | B   |
| 01639 - MOLECULAR BIOLOGY<br><i>Pintaudi(RU)</i>                                       | 6   | 2    | V    | BIO/11  | B   |
| 01874 - PHYSICAL CHEMISTRY<br><i>Lazzara(PO)</i>                                       | 8   | 2    | V    | CHIM/02 | A   |
| 05070 - PHYSICAL METHODS IN ORGANIC CHEMISTRY<br><i>Fontana(RU)</i>                    | 8   | 2    | V    | CHIM/06 | C   |

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| Subjects 3 ° year   | CFU | Sem. | Val. | SSD     | TAF |
|---|-----|------|------|---------|-----|
| 13175 - GENERAL PHYSIOLOGY AND PATHOLOGY (MEDICAL TERMINOLOGY) - INTEGRATED COURSE  | 14  | 1    | V    |         |     |
| - GENERAL PHYSIOLOGY<br><i>La Guardia(PQ)</i>   | 8   | 1    |      | BIO/09  | A   |
| - PATHOLOGY (MEDICAL TERMINOLOGY)<br><i>Vasto(PA)</i>   | 6   | 1    |      | MED/04  | A   |
| 01873 - PHARMACEUTICAL AND TOXICOLOGICAL CHEMISTRY 1<br><i>Almerico(PO)</i>   | 8   | 1    | V    | CHIM/08 | B   |
| 13181 - PHARMACEUTICAL TECHNOLOGY, SOCIOECONOMICS AND REGULATIONS AND TECHNOLOGY OF PHARMACEUTICAL FORMULATIONS - INTEGRATED COURSE | 12  | Ann. | V    |         |     |
| - PHARMACEUTICAL TECHNOLOGY, SOCIOECONOMICS AND REGULATIONS<br><i>Fiorica(PA)</i>   | 6   | 1    |      | CHIM/09 | B   |
| - TECHNOLOGY OF PHARMACEUTICAL FORMULATIONS<br><i>Cavallaro(PO) [A-L], De Caro(PA) [M-Z]</i>  | 6   | 2    |      | CHIM/09 | B   |

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| Subjects 3 ° year  | CFU | Sem. | Val. | SSD     | TAF |
|--|-----|------|------|---------|-----|
| 01205 - DRUG ANALYSIS<br><i>Parrino(PA) [A-L], Parrino(PA) [M-Z]</i>             | 10  | 2    | V    | CHIM/08 | B   |
| 01832 - FOOD CHEMISTRY<br><i>Avellone(PA)</i>                                    | 8   | 2    | V    | CHIM/10 | C   |
| 03153 - PHARMACOLOGY AND PHARMACOTHERAPY<br><i>Notarbartolo Di Villarosa(PA)</i> | 8   | 2    | V    | BIO/14  | B   |

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| Subjects 4 ° year   | CFU | Sem. | Val. | SSD     | TAF |
|---|-----|------|------|---------|-----|
| 18084 - APPLIED PHARMACEUTICAL TECHNOLOGY<br><i>Licciardi(PO)</i>                                     | 8   | 1    | V    | CHIM/09 | B   |
| 01870 - MEDICINAL AND TOXICOLOGICAL CHEMISTRY 2<br><i>Diana(PO)</i>                                   | 8   | 1    | V    | CHIM/08 | B   |
| 08437 - PHARMACOLOGY AND TOXICOLOGY<br><i>Labbozzetta(RU)</i>   | 6   | 1    | V    | BIO/14  | B   |
| 05184 - SPECIAL METHODOLOGIES IN PHARMACEUTICAL ANALYSIS<br><i>Lauria(PO) [A-L], Lauria(PO) [M-Z]</i> | 10  | 1    | V    | CHIM/08 | B   |
| Optional subjects   | 18  |      |      |         | B   |
| Free subjects (suggested)   | 12  |      |      |         | D   |

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| Subjects 5 ° year             | CFU | Sem. | Val. | SSD | TAF |
|-------------------------------|-----|------|------|-----|-----|
| 07553 - PROFESSIONAL PRACTICE | 30  | 1    | G    |     | S   |
| 05917 - FINAL EXAMINATION     | 28  | 2    | G    |     | E   |

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## OPTIONAL SUBJECTS

| Optional subjects   | CFU | Sem. | Val. | SSD     | TAF |
|---|-----|------|------|---------|-----|
| 13186 - ADVANCED MEDICINAL CHEMISTRY AND DRUG DESIGN - INTEGRATED COURSE                            | 12  | 2    | V    |         |     |
| - DRUG DESIGN<br><i>Tutone(PA)</i>  | 6   | 2    | V    | CHIM/08 | B   |
| - ADVANCED PHARMACEUTICAL CHEMISTRY<br><i>Tutone(PA)</i>  | 6   | 2    | V    | CHIM/08 | B   |
| 13368 - ADVANCED PHARMACEUTICAL TECHNOLOGY AND PHARMACEUTICAL INDUSTRIAL PLANTS - INTEGRATED COURSE | 12  | 2    | V    |         |     |
| - PHARMACEUTICAL INDUSTRIAL PLANTS<br><i>Licciardi(PO)</i>  | 6   | 2    | V    | CHIM/09 | B   |
| - ADVANCED PHARMACEUTICAL TECHNOLOGY<br><i>Mauro(PA)</i>  | 6   | 2    | V    | CHIM/09 | B   |
| 01548 - APPLIED BIOCHEMISTRY<br><i>Allegra(PO)</i>  | 6   | 2    | V    | BIO/10  | B   |
| 01682 - PHARMACOLOGICAL BIOTECHNOLOGIES<br><i>Notarbartolo Di Villarosa(PA)</i>                     | 6   | 2    | V    | BIO/14  | B   |
| Free subjects (suggested)   | CFU | Sem. | Val. | SSD     | TAF |
| 05174 - ADVANCED METHODOLOGIES IN PHARMACEUTICAL CHEMISTRY<br><i>Barreca(RD)</i>                    | 6   | 2    | V    | CHIM/08 | D   |

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## OPTIONAL SUBJECTS

| Free subjects (suggested)   | CFU | Sem. | Val. | SSD     | TAF |
|---|-----|------|------|---------|-----|
| 19166 - CHEMISTRY OF NATURAL BIOACTIVE SUBSTANCES<br><i>Rizzo(RD)</i> | 6   | 2    | V    | CHIM/06 | D   |
| 07711 - DRUG VEHICULATION AND TARGETING<br><i>Palumbo(PO)</i>         | 6   | 2    | V    | CHIM/09 | D   |

## PROPAEDEUTICAL TEACHINGS

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| 01205 - DRUG ANALYSIS   |  |  |  |  |  |
| 01799 - ANALYTICAL CHEMISTRY  |  |  |  |  |  |
| 01211 - PHARMACEUTICAL ANALYSIS OF DRUGS  |  |  |  |  |  |
| 01211 - PHARMACEUTICAL ANALYSIS OF DRUGS  |  |  |  |  |  |
| 01900 - GENERAL AND INORGANIC CHEMISTRY   |  |  |  |  |  |
| 01542 - BIOCHEMISTRY  |  |  |  |  |  |
| 01900 - GENERAL AND INORGANIC CHEMISTRY   |  |  |  |  |  |
| 01799 - ANALYTICAL CHEMISTRY  |  |  |  |  |  |
| 01900 - GENERAL AND INORGANIC CHEMISTRY   |  |  |  |  |  |
| 01832 - FOOD CHEMISTRY  |  |  |  |  |  |
| 01933 - ORGANIC CHEMISTRY   |  |  |  |  |  |
| 01870 - MEDICINAL AND TOXICOLOGICAL CHEMISTRY 2   |  |  |  |  |  |
| 01873 - PHARMACEUTICAL AND TOXICOLOGICAL CHEMISTRY 1  |  |  |  |  |  |
| 01873 - PHARMACEUTICAL AND TOXICOLOGICAL CHEMISTRY 1  |  |  |  |  |  |
| 01933 - ORGANIC CHEMISTRY   |  |  |  |  |  |
| 01874 - PHYSICAL CHEMISTRY  |  |  |  |  |  |
| 01900 - GENERAL AND INORGANIC CHEMISTRY   |  |  |  |  |  |
| 13167 - MATHEMATICS AND PHYSICS - INTEGRATED COURSE   |  |  |  |  |  |
| 01933 - ORGANIC CHEMISTRY   |  |  |  |  |  |
| 01900 - GENERAL AND INORGANIC CHEMISTRY   |  |  |  |  |  |
| 03153 - PHARMACOLOGY AND PHARMACOTHERAPY  |  |  |  |  |  |
| 13175 - GENERAL PHYSIOLOGY AND PATHOLOGY (MEDICAL TERMINOLOGY) - INTEGRATED COURSE  |  |  |  |  |  |
| 05070 - PHYSICAL METHODS IN ORGANIC CHEMISTRY   |  |  |  |  |  |
| 01933 - ORGANIC CHEMISTRY   |  |  |  |  |  |
| 05184 - SPECIAL METHODOLOGIES IN PHARMACEUTICAL ANALYSIS  |  |  |  |  |  |
| 01205 - DRUG ANALYSIS   |  |  |  |  |  |
| 01933 - ORGANIC CHEMISTRY   |  |  |  |  |  |
| 08437 - PHARMACOLOGY AND TOXICOLOGY   |  |  |  |  |  |
| 03153 - PHARMACOLOGY AND PHARMACOTHERAPY  |  |  |  |  |  |
| 13175 - GENERAL PHYSIOLOGY AND PATHOLOGY (MEDICAL TERMINOLOGY) - INTEGRATED COURSE  |  |  |  |  |  |
| 01286 - HUMAN ANATOMY   |  |  |  |  |  |
| 13167 - MATHEMATICS AND PHYSICS - INTEGRATED COURSE   |  |  |  |  |  |
| 13181 - PHARMACEUTICAL TECHNOLOGY, SOCIOECONOMICS AND REGULATIONS AND TECHNOLOGY OF PHARMACEUTICAL FORMULATIONS - INTEGRATED COURSE |  |  |  |  |  |
| 01874 - PHYSICAL CHEMISTRY  |  |  |  |  |  |
| 13186 - ADVANCED MEDICINAL CHEMISTRY AND DRUG DESIGN - INTEGRATED COURSE  |  |  |  |  |  |
| 01870 - MEDICINAL AND TOXICOLOGICAL CHEMISTRY 2   |  |  |  |  |  |

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13368 - ADVANCED PHARMACEUTICAL TECHNOLOGY AND PHARMACEUTICAL INDUSTRIAL PLANTS - INTEGRATED COURSE

13181 - PHARMACEUTICAL TECHNOLOGY, SOCIOECONOMICS AND REGULATIONS AND TECHNOLOGY OF PHARMACEUTICAL FORMULATIONS - INTEGRATED COURSE

Legenda: Per. = periodo o semestre, Val. = Valutazione (V=voto, G=giudizio), TAF= Tipologia Attività Formativa (A=base, B=caratterizzante, C=Affine, S=stages, D=a scelta, F=altre)