

## Faculty of **Sciences and Technologies**

### Second level degree program in **Chemistry and Advanced Chemical Methodologies**

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## **SECOND LEVEL DEGREE**

The Second Level Degree in "*Chemistry and Advanced Chemical Methodologies*", belongs to the Class 62/M (Chemical Sciences). To obtain the specialist degree (LM) the student needs to achieve 120 credits in four semesters. After the first semester, based on common topics, the student can make a choice between two proposed routes: (i) *Synthesis and Molecular Reactivity* and (ii) *Chemical Methodologies for Control and Analysis*.

## **FORMATIONAL OBJECTIVES**

The objective of the course of Second level Degree in **Chemistry and Advanced Chemical Methodologies** is the preparation of professional figures able to operate in chemical laboratories, to search for new methodologies of synthesis of new substances, to analyze environmental or industrial samples, to study instrumentally or theoretically chemical structures, etc.

The magisterial graduate in **Chemistry and Advanced Chemical Methodologies** will owe:

- to possess a good knowledge in basic sectors of chemistry and a high scientific and operational preparation
- to be able also in using complex instrumentations concerning analytical and structural determination of chemical compounds
- to possess theoretical and practical knowledge in safety of laboratories
- to possess good abilities in the use of computer systems such as management of data banks and data elaboration
- to be able also in carrying out complex bibliographical searches using data banks and computer nets
- to possess a good knowledge of the English language within the activity and the professional relationships.

The graduate will have a preparation that will allow him a ready occupation both in public structures and in centres of research and development of chemical industries.

The Course of Degree will predispose opportune curricula finalized to the specialization in aspects of chemical preparation of particular interest. Below are introduced, as example, the objectives of two curricula of interest of this course of degree that are dealing respectively with advanced methodologies of synthesis and advanced methodologies of analysis.

The first curriculum has the purpose to give experience in the field of the organic and inorganic synthesis, in the determination of the structure and in the study of the reactivity, using the most advanced technologies. To reach this goal, the graduate must be able to perform the determination of the structure and the structure/property relationships of compounds also of biological interest, using analytical techniques and advanced instrumentations. The student must know how to plan and execute a synthesis in more steps of organic, inorganic and metallorganic compounds, also very complex, in particular molecules or compounds showing biological and pharmacological activity, using high-level computational methods and classical and innovative synthetic methodologies, privileging the synthesis and the asymmetrical catalysis and the respectful methods of the environment. He will be also able to study the mechanisms of action of biologically active molecules, as natural organic substances, molecules of the secondary metabolism, enzymatic inhibitors, medicines, natural and synthetic aminoacids, peptides, antibiotics, antitumor compounds, metal-enzymes, etc.

This curriculum is therefore finalized to create very specialized graduates, able to develop activity in public and private structures of research, in advanced sectors of the production (chemical industries for the preparation of intermediates, pharmaceutical, petrochemical, of polymeric materials, agro-alimentary, biotechnological, cosmetics, etc.) and in the field of the Chemistry of life and environment, where specific chemical competences are required.

The second curriculum has the purpose to form professional figures that possess the tools to program the analysis of a real sample. To the base knowledge on the most common techniques, acquired in the first level degree, more detailed knowledge and practical experiences on the most modern instruments will be added.

In coherence with the qualifying formative objectives of the Class 62/M, the graduated will own a good knowledge on the analytical and more advanced characterization techniques, ability to evaluate possibilities and limits of an analytical technique, ability to organize this knowledge to face and solve complex problems related to the analysis of real samples, ability to use computerized systems for acquisition, management and data processing, also in complex and multidisciplinary fields (for instance, ability of interface the analytical instrumentation with computers and use or adapt statistic and chemiometrics methods).

This curriculum is therefore finalized to form a graduate that will have competences and ability to drive analytical laboratories, with responsibility of operational projects and development of innovative methods in the industry, in the Corporate body of public and private Control, in the Corporate body of public and private Research.

The flexibility of the arrangement allows the activation of different curricula concerning other chemical methodologies.

### **CHARACTERISTICS OF THE FINAL TEST**

Discussion of a thesis having character of original research in the select field.

### **EMPLOYMENT PROSPECTS**

In public and private research structures. Free profession. Advanced sectors of the production (chemical industries for the preparation of intermediates, pharmaceutical, petrochemical, polymeric materials, agro-alimentary, biotechnological, cosmetics, etc.) and in the field of Chemistry of life and environment, where specific chemical competences are required. Laboratories of chemical analysis, with responsibility of operational projects and development of innovative methods, in the industry, in the Corporate body of public and private Control and Research.

### **REQUIREMENTS FOR THE ACCESS TO THE LM**

To access to the second level degree in Chemistry and Advanced Chemical Methodologies the student needs a first level degree; (ii) to have acquired a minimum of 120 university (CFU) formative credits pertinent to the selected second level Degree.

### **RULE**

Further informations are available in the Didactic Rule of the Class n. 62/M (Chemical Sciences), available also in the site Internet of Unicam ([www.unicam.it](http://www.unicam.it)), together to all the other documents of didactic-scientific planning related to the course of Degree in "Chemistry" and "Chemistry and Advanced Chemical Methodologies."

### CFU in Common among the two addresses

Formative activity	CFU	Field
Thesis	40	
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Physical Chemistry	5	CHIM/02
Environmental Chemistry	6	CHIM/12
Advanced Organic Chemistry	5	CHIM/06
Advanced Inorganic Chemistry	5	CHIM/03
Free activities	5	
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<b>Tot. 66</b>		

### A) Curriculum Synthesis and Molecular Reactivity (lessons given in English).

	CFU	Field
-Advanced Organic Stereochemistry	4	CHIM/06
-Physical methods of Investigation	10	CHIM/06-ING-IND/23
-Inorganic Industrial Chemistry	4	CHIM/03
-Organic Synthesis Laboratory	10	CHIM/06
-Organic Biological Chemistry	8	CHIM/06-ING-IND/27
-Synthesis and reactivity in Inorganic Chemistry	8	CHIM/03
-Chemistry of Inorganic Materials	10	CHIM/03
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<b>Tot. 54</b>		

### B) Curriculum Chemical Methodologies for Control and Analysis

	CFU	Field
- Instrumental Analytical Chemistry I e II	12	CHIM/01
-Lab. of Analytical and Environmental Chemistry	11	CHIM/01-CHIM/12
-Chemimetry	5	CHIM/01
-Tecnol. for waste treatment and Environmental Legisl.	11	CHIM/12-CHIM/01-IUS/07
-Industry and Environment	8	MED/42-CHIM/12-SECS-P/08
-Chemical and Biological Environmental Monitoring	7	CHIM/12-BIO/07
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<b>Tot. 54</b>		