DESCRIPTION OF THE CURRICULUM
(TEACHING REGULATIONS OF THE COURSE)

BACHELOR'S DEGREE COURSE IN
CHEMISTRY AND INDUSTRIAL CHEMISTRY (L-27R)

academic year 2025/26

Outline

Art. 1 - General characteristics and organization

The Bachelor's Degree Course in Chemistry and Industrial Chemistry, class L-27R – Chemical Sciences and Technologies – is activated according to the educational regulations of the academic year 2025/2026.

The course in brief

Chemistry is a constantly evolving fundamental science, with deep implications for every aspect of human life, the environment, nature, and the technological development of society. Chemical research focuses on the design and preparation of innovative substances, as well as the study of their production processes in several sectors. In a society that values not only the technological development but also health and sustainability, chemistry plays a fundamental role in optimizing low-environmental-impact industrial processes (green chemistry), recycling processes (circular economy), and the search for renewable energy sources.

The program aims at providing knowledge and skills (theoretical, methodological, and applied) in the four fundamental areas of chemistry - analytical chemistry, physical chemistry, inorganic chemistry and organic chemistry - supported by an adequate preparation in mathematics and physics, as well as in the English language. The program also allows students to individually design part of their program through related/complementary and elective courses, as well as through an internship.

Graduates in Chemistry and Industrial Chemistry can continue their university studies as part of a second-level program or enter the job market directly. The profession of Chemical Technician is regulated by the National Federation of Chemists and Physicists, and registration is possible after passing an exam.

The structure responsible for the course is the Department of Science and High Technology. The Program Coordinator is Prof. Massimo Mella.

The Didactic Secretariat receives by appointment in via Valleggio 11 (4th floor) and replies to emails through INFOSTUDENTI. More information about this can be found at the following link: INFOSTUDENTI.

Art. 2 - Teaching calendar of the course

Educational activities take place in Como. The internet address of the course is the following: https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/chimica-e-chimica-industriale

The lesson calendar is published under the page **LESSON TIMETABLE:**
https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/chimica-e-chimica-industriale

The teaching calendar is divided into semesters:
I semester from **22 September 2025 to 16 January 2025**
II semester from **16 February 2026 to 12 June 2026**

Exams

There are at least 6 sessions for each course during the period of lessons suspension. The calendar of the exams is published on the page https://uninsubria.esse3.cineca.it/ListaAppelliOfferta.do

Art. 3 - Education goals, expected learning outcomes and career opportunities

To achieve the bachelor's degree, a program without a subdivision into curricula has been designed to meet the requirements of the Core Chemistry model developed by the Italian Chemical Society. The basic preparation includes preparatory training in mathematics and physics. The curriculum provides students with substantial chemical knowledge in the four fundamental areas of chemistry: general and inorganic chemistry, analytical chemistry, physical chemistry and organic chemistry. Each of these areas is assigned an equal number of credits, approximately one-third of which is reserved for numerical and laboratory exercises. Core training activities also include courses in biochemistry and industrial chemistry.

The scientific sectors offered for related and complementary activities allow for in-depth study on cutting-edge topics, focusing not only on the society's technological development but also on every aspect of human life and the natural environment.

PREPARATORY TRAINING AREA

Knowledge and understanding

Basic knowledge of mathematics and algebra. Basic knowledge of physics. Basic knowledge of English.

Ability to apply knowledge and understanding

Ability to apply basic theoretical and applied knowledge of mathematics and physics to chemistry. Ability to apply basic English language skills to convey concepts and knowledge learned through chemistry courses.

GENERAL AND INORGANIC CHEMISTRY AREA

Knowledge and understanding

Knowledge and understanding of the main aspects of chemical terminology and nomenclature. Knowledge and understanding of the characteristics of the three fundamental physical states of matter and the models used to rationalize them. Knowledge and understanding of the characteristic chemical-physical properties of the elements, including their placement in the Periodic Table and their electronic configuration. Knowledge and understanding of the different types of chemical bonds and non-bonding interactions, as well as the theories that rationalize them. Knowledge and understanding of the main types of chemical reactions and their characteristics, in solution, in the solid phase and in the gas phase. Knowledge and understanding of basic stoichiometric calculations, with particular emphasis on balancing chemical reactions, the behavior of acids and bases in aqueous solution, the behavior of poorly soluble salts in aqueous solution, energy balances, and the determination and use of equilibrium thermodynamic constants and rate constants. Knowledge and understanding of the main synthetic techniques used for inorganic compounds or coordination with classical ligands.

Knowledge and understanding of the stereochemistry, molecular structure, chemical-physical properties, and reactivity of inorganic compounds and compounds coordinated with classical ligands. Knowledge and understanding of the main characterization techniques, in solution and solid phase, used for inorganic compounds or compounds coordinated with classical ligands.

Ability to apply knowledge and understanding

Ability to correctly use basic chemistry nomenclature and terminology. Ability to predict the chemical

properties of an element based on its electronic configuration and its position in the Periodic Table. Ability to identify the types of chemical bonds and non-bonding interactions characterizing a chemical substance. Ability to perform stoichiometric calculations, with particular emphasis on balancing chemical reactions, the chemistry of acids, bases, and sparingly soluble salts in aqueous solution, energy balances, and the determination and use of equilibrium thermodynamic constants and rate constants. Ability to synthesize simple inorganic and coordination compounds using laboratory procedures and instrumentation.

ANALYTICAL CHEMISTRY AREA

Knowledge and understanding

Knowledge and understanding of the concepts of accuracy and precision, error propagation laws, and the univariate statistical tools used to evaluate them. Knowledge and understanding of equilibria in aqueous solutions, with particular reference to acid-base, oxidation-reduction, precipitation, and complexation equilibria. Knowledge and understanding of the concept of activity and its implications for solution equilibria. Knowledge and understanding of volumetric analysis methods and techniques used for endpoint determination. Knowledge of the theoretical aspects of acid-base indicators. Basic knowledge and understanding of the principles of electrochemistry, with particular reference to the thermodynamic aspects of potentiometry. Knowledge and understanding of the various instrumental calibration methods, with particular reference to external calibration methods, the multiple addition method, and internal standardization methods.

Basic knowledge and understanding of potentiometric investigation techniques. Knowledge and understanding of the theoretical aspects and instrumental configurations related to: i) UV-visible and mid-infrared molecular absorption spectroscopy; ii) gas chromatography (GC) and high-performance liquid chromatography (HPLC); iii) flame and electrothermal atomizer atomic absorption spectroscopy (FAAS and ETAAS) and atomic emission spectroscopy (ICP-OES); iv) mass spectrometry (MS). Knowledge and understanding of the applications of hyphenated techniques (GC-MS, LC-MS, and ICP-MS).

Ability to apply knowledge and understanding

Ability to use univariate statistical methods to evaluate experimental data obtained from replicate series. Ability to approach complex equilibria in aqueous solutions from the perspective of calculating concentrations. Ability to perform acid-base, redox, complexometric, and gravimetric titrations using indicators and/or instrumental methods for endpoint determination. Ability to use potentiometric methods to determine pH and the concentration of ionic species in solution. Ability to prepare diluted standards and perform instrumental calibrations for atomic and molecular absorption spectroscopies, gas chromatography techniques, and liquid chromatography techniques. Ability to analyze samples with unknown analyte concentrations using volumetric and/or instrumental analysis methods. Ability to use the most common methods for processing solid, liquid, and gaseous samples to transform, purify, and concentrate the original sample. Ability to choose the best analytical method based on the analyte, the concentration range to be determined, the expected level of precision and the sample matrix.

PHYSICAL CHEMISTRY AREA

Knowledge and understanding

Knowledge and understanding of the principles of chemical thermodynamics and their applications. Knowledge and understanding of the principles of quantum mechanics and their application in describing the structure and properties of atoms and molecules. Knowledge and understanding of the principles of

statistical mechanics, with particular emphasis on chemical processes. Knowledge and understanding of the principles of spectroscopy and its applications in chemistry. Knowledge and understanding of the principles of chemical kinetics and its use in the mechanistic interpretation of chemical reactions.

Ability to apply knowledge and understanding

Capacità di applicare i principi della termodinamica a problematiche in ambito chimico. Capacità di applicare i principi della meccanica quantistica e della spettroscopia per la descrizione della struttura e delle proprietà di atomi, molecole e loro fasi condensate. Capacità di applicare la meccanica statistica per la descrizione della struttura e delle proprietà di atomi, molecole e loro fasi condensate. Capacità di applicare i principi della cinetica chimica per misurare grandezze chimico-fisiche, quali costanti termodinamiche di equilibrio e di velocità, e relazionarle alle proprietà microscopiche e strutturali delle molecole.

ORGANIC CHEMISTRY AND BIOCHEMISTRY AREA

Knowledge and understanding

Conoscenza e comprensione della nomenclatura dei composti organici secondo le regole IUPAC, dei gruppi funzionali e della loro conversione e reattività, nonché dei meccanismi delle reazioni tipiche della Chimica organica. Conoscenze e comprensione della Chimica organica nell'ambito dei gruppi funzionali azotati, ossigenati, solforati, e dei composti aromatici. Conoscenza delle proprietà del legame Carbonio-Carbonio e dei legami Carbonio-Eteroatomo con relative caratteristiche. Conoscenza delle metodologie opportune per la formazione e la rottura di questi legami. Conoscenza e comprensione del contesto cellulare in cui i processi metabolici hanno luogo, delle principali classi di biomolecole, dei processi metabolici e dei relativi aspetti bioenergetici, nonché dei processi che regolano il metabolismo a livello di cellula e di sistema.

Ability to apply knowledge and understanding

Capacità di utilizzare la terminologia opportuna per nominare le molecole organiche e di descrivere la loro reattività. Capacità di comprendere le proprietà e la reattività dei sistemi aromatici ed eteroaromatici in funzione della loro struttura molecolare e di eventuali gruppi funzionali. Capacità di pianificare una sintesi multi-stadio di molecole aromatiche a partire da precursori assegnati. Capacità di progettare ed eseguire la sintesi e la caratterizzazione di composti organici semplici, utilizzando procedure e strumentazioni *standard* di laboratorio tipiche della Chimica organica. Capacità di descrivere le principali classi di biomolecole, i processi metabolici e i relativi aspetti bioenergetici, nonché i processi che regolano il metabolismo a livello di cellula e di sistema.

INDUSTRIAL CHEMISTRY AND CHEMICAL TECHNOLOGIES AREA

Knowledge and understanding

Knowledge and understanding of polymer chemistry, the language used in macromolecular chemistry, and the basic tools for understanding macromolecular production mechanisms and their property-structure relationships.

Ability to apply knowledge and understanding

Ability to identify the polymerization mechanism suitable for a given monomer, to describe the experimental methods for characterizing the molecular weight and the main thermal transitions of the obtained polymer, to correlate the thermal and mechanical properties of the polymer with its chemical structure.

JOB OPPORTUNITIES

Bachelor's degree graduates assist master's degree graduates in Chemistry in the development of new products, processes, or formulations, or in production activities requiring the application of chemical procedures and protocols. They perform technical tasks to control and maintain production quality and environmental quality standards; they collaborate in managing the operation and safety of equipment, plants, and related technical systems. Their role involves applying defined and predetermined protocols and consolidated knowledge, executing them in testing or production activities.

The bachelor's degree graduates can:

- work in R&D laboratories, analysis laboratories, production departments and the marketing department of chemical or similar industries;
- work at public and private entities operating in sectors interconnected with chemical sciences and technologies (environment, health, workplace safety, energy production, conservation of cultural heritage);
- take the qualifying exam for the profession of Chemist for first-level graduates and therefore register in the Junior Section of the Professional Register of Chemists;
- continue university studies as part of a second-level training course (master's degree).

Art. 4 - Admission to the course

For the 2025/2026 academic year, enrollment in the Degree Course in Chemistry and Industrial Chemistry is open to all.

Initial preparation verification methods

The Ministerial Decree 270/2004 requires a mandatory assessment of the initial preparation of students enrolling in a L-27 degree program. For enrollment in the open-access degree program in Chemistry and Industrial Chemistry, the test is not selective but must be taken, even if unsuccessful, by November 27, 2025.

The Degree Program in Chemistry and Industrial Chemistry adheres to the Coordination of Knowledge Assessment Tests for Science Degree Programs, managed by the National Conference of Presidents and Directors of University Structures of Science and Technology (con.Scienze) in collaboration with the National Plan for Scientific Degrees (PLS) of the Ministry of University and Research and the Inter-university Consortium of Integrated Access Systems (CISIA). Therefore, the Degree Program adopts the TOLC-S (CISIA Online Test, in TOLC@Casa mode) as a test to assess the initial preparation. Students can take the test to assess their initial preparation even before enrolling and/or at another university in Italy. In this case, the test result will be credited after completing the enrollment, upon presentation of the relevant certification issued by CISIA.

The test is considered passed if the student correctly answers at least 10 of the 20 questions in the Basic Mathematics module. If the student fails to pass the test by November 27, 2025, he/she will be assigned an Additional Learning Requirement (OFA) to be completed by September 30, 2026. Students with OFA requirements will be provided with materials in the e-learning area to help them complete the exam.

Regular enrollment in the second year of the course is subject to the following requirements:

- Taking the TOLC-S to assess the initial preparation **at least once by November 27, 2025**, even if

not passed, as it is mandatory;

- Completion of the OFA, if assigned, by meeting one of the following requirements **by September 30, 2026**:
  - Passing the initial preparation test;
  - Passing a test specifically prepared by the teachers in Basic Mathematics;
  - Passing the Mathematics 1 exam, a course scheduled in the first semester of the first year of the program.

Preparatory training activities for the verification of the initial preparation

In the first half of September, math lessons will be provided. All information, including dates, will be published on the following website page:
https://www.uninsubria.it/formazione/consigli-e-risorse-utili/orientamento/orientamento-ingresso/preparati-alluniversita

Information on the Maths lessons for the Scientific Area are available at this link:
https://www.uninsubria.it/formazione/consigli-e-risorse-utili/orientamento/orientamento-ingresso/preparati-alluniversita-5

Exemptions

You do not need to take the test if:

- you are transferring from another degree program at the University of Insubria (internal transfer), provided you have taken and passed an initial assessment test similar to that required for your degree program.
- you are transferring from another university where you have already taken and passed an initial assessment test similar to that required for your degree program.
- you are enrolling with a degree that includes a mathematics exam in the curriculum.
- you have already successfully taken a similar test at another university.

If you are interested in obtaining an exemption, you must send the Student Secretariat, upon enrollment, a certification attesting to having passed the test (at least 10 correct answers in the Basic Mathematics module).

Art. 5 - Education Path

The Degree Course in Chemistry and Industrial Chemistry does not include curricula.

12 University Training Credits (CFU) are attributed to the core subjects (TAF-A, mandatory) of **Mathematics and Physics**, while 3 CFU are attributed to English. Additional 24 CFU are attributed to each of the four core areas of Chemistry through core courses (TAF-A) and "characterizing" courses (TAB-B, mandatory). In addition, 6 CFU are attributed to Biochemistry (TAF-B) and 6 CFU to Chemistry and Polymer Technology (TAF-B).

To allow for individual planning of part of the curriculum, 18 credits are allocated to related/complementary courses (TAF-C) and 12 credits to elective courses (TAF-D). Courses from other degree programs may also be selected as elective courses, provided they are consistent with the goals of the Degree Program in Chemistry and Industrial Chemistry and have a different title than those of the Degree Program in Chemistry

and Industrial Chemistry.

The program ends with a training internship (10 credits), which is a practical experience in a university research laboratory or at a company or public or private institution with which an appropriate agreement has been signed and a training project has been defined for the student, or a bibliographical research on a topic consistent with the study program. The internship experience is presented in the Final Exam (3 credits) before the Degree Commission, which evaluates its content and methods.

Teaching for the Degree Program in Chemistry and Industrial Chemistry is delivered through conventional lectures and classroom exercises, as well as in laboratory. Specifically:

Lectures: This is the main and fundamental teaching activity; students attend lectures and independently process the content they have listened to.

Exercises: This activity allows to understand completely the content of lectures through the development of applications. No additional content is added to the lectures. Typically, exercises are associated with lectures and do not exist independently. In "passive" exercises, the application development is performed by the instructor; in active exercises, students develop applications under the instructor's supervision.

Laboratory: This is a supervised activity that involves the student interaction with tools, equipment, or application software packages.

Attendance is required for at least 75% of the exercises and laboratories.

CFU/hours correspondance for each type of activity

University Educational Credits (CFU) are a measurement of the amount of learning, including individual study, required to a student with an adequate initial preparation to acquire knowledge and skills in the educational activities required by the degree program.

Any educational activity (teaching, laboratory, internship, thesis, etc.) within the degree program corresponds to a specific number of educational credits (CFU).

Each CFU corresponds to 25 hours of commitment, given by the hours of lectures and laboratory and the ones of independent study necessary to complete the student's preparation.

The CFU number corresponding to each educational activity is acquired by the student upon passing the exam or any other form of assessment defined in the degree program rules.

Educational Activities / CFU:

- 8 hours of lectures with 17 hours of individual study;
- 12 hours of practical exercises with 13 hours of individual study;
- 12 hours of laboratory work with 14 hours of individual study.

The credits corresponding to each training activity are acquired by the student upon passing the exam or other form of assessment established in the course regulations.

Assessment Methods for Educational Activities

Assessment methods for individual courses is based on written, oral, and/or practical exams (with a report). To take the exams, students must be regularly enrolled in the Degree Program. If the course specifically provides credits for exercises or laboratory work, the participation in the exam is subject to the verification of the minimum attendance hours indicated in the regulations. Further details regarding the specific

assessment and evaluation methods for individual courses are specified in the respective syllabi.

Propaedeutics

COURSE FOR WHICH THE PROFICIENCY EXAM IS NOT SUSTAINABLE	IF YOU HAVE NOT PASSED THE FOLLOWING EXAM
- OEGANIC CHEMISTRY 1 - CHEMICAL THERMODYNAMICS	FUNDAMENTALS OF GENERAL CHEMISTRY
- PHYSICAL CHEMISTRY 1 - ANALYTICAL CHEMISTRY - INORGANIC CHEMISTRY - ORGANIC CHEMISTRY 2 - POLYMER CHEMISTRY AND TECHNOLOGY - INSTRUMENTAL ANALYTICAL CHEMISTRY - PHYSICAL CHEMISTRY 2 - BIOCHEMISTRY - *GREEN* METHODS IN ANALYTICAL CHEMISTRY - APPLIED ANALYTICAL CHEMISTRY - MICELLES, COLLOIDS AND SURFACES - MOLECULAR PROGRAMMING AND VISUALISATION - SYNTHESIS TECHNIQUES IN INORGANIC CHEMISTRY - CHARACTERIZATION TECHNIQUES IN INORGANIC CHEMISTRY - PHYSICAL METHODS IN ORGANIC CHEMISTRY - COMPLEMENTS OF ORGANIC CHEMISTRY - APPLIED ORGANIC CHEMISTRY - DEVELOPMENT AND OPTIMIZATION IN ORGANIC SYNTHESIS - FORENSIC CHEMISTRY - CHEMISTRY AND TECHNOLOGY OF COLORANTS - CHEMISTRY AND TECHNOLOGY OF FORMULATIONS - CHEMISTRY AND TECHNOLOGY OF THE TEXTILE INDUSTRY - WASTE TREATMENT AND WATER PURIFICATION - FOOD CHEMISTRY AND TECHNOLOGY - QUALITY AND SAFETY IN INDUSTRY	FUNDAMENTALS OF GENERAL CHEMISTRY GENERAL CHEMISTRY COMPLEMENTS
MATHEMATICS 2	MATHEMATICS 1
PHYSICS 2	PHYSICS 1
ORGANIC CHEMISTRY 2	ORGANIC CHEMISTRY 1
PHYSICAL CHEMISTRY 2	PHYSICAL CHEMISTRY 1

Art. 6 - Rules for submitting study plans

Students must submit their Study Plan in their third year, with the possibility of modifying it in the following years, according to the deadlines set annually and reported on the Student Secretariat web pages: https://www.uninsubria.it/servizi/presentazione-piano-di-studio.

Students have to compile their study plan online by accessing their ESSE3 reserved area and must indicate:

- related/complementary courses (TAF C), which are worth 18 credits;
- elective courses (TAF D), which are worth 12 credits.

Student Elective Courses (letter D)

As part of the "Student Elective Courses" program, students may choose, starting in their third year, from:

- Courses offered in the Chemistry and Industrial Chemistry program if not already chosen, or recommended courses consistent with their curriculum.
- Courses from other programs offered by the Department or the University, provided they are consistent with their curriculum and subject to approval by the Degree Program Council. In this case, the study plan must be submitted in paper format by requesting the form from the Student Secretariat via INFOSTUDENTI.

Courses offered by limited access University degree programs cannot be chosen.

Further language skills, IT and interpersonal skills, internships and other (letter F)

Recognition of language certifications

Recognition of 3 CFU for Scientific English is automatic upon presentation to the Student Secretariat, through the Infostudenti service, of a certificate proving passing one of the following tests, which may have been taken independently by the student:

- University of Cambridge Examinations (PET, FCE, CAE, CPE, BEC 1-3, CELS - all levels);
- Trinity College London Examinations (ESOL Grades 5-12, ISE levels I–III);
- TOEFL Examinations (Paper-Based Test Score > 457, Computer-Based Test Score > 137);
- City & Guilds Pitman Qualifications (ESOL Intermediate–Advanced, SESOL Intermediate–Advanced).

If you submit a certificate or attestation other than those listed above to the Student Secretariat, any recognition will be assessed by the Degree Programme Council.

Recognition of computer skills

2 CFU relating to IT skills are automatically recognized after passing the exam for the General Chemistry Complements course scheduled for the first year of the course.

Art. 7 - Opportunities offered during the training path

The program promotes several initiatives that complement and enrich the academic experience. In particular, it is possible to participate in mobility and internationalization programs:

Il corso di studio promuove alcune iniziative che vanno a completare e arricchire l'esperienza accademica, in particolare è possibile partecipare ai programmi di mobilità e internazionalizzazione:

- **Mobility abroad – Erasmus and other opportunities**
  https://www.uninsubria.it/internazionale/mobilita-allestero/programma-erasmus
- **Tutoring service** (https://www.uninsubria.it/servizi/tutti-i-servizi/tutorato)
  It consists of a series of activities aimed at orienting, assisting, advising, and informing students. In addition to the university information service, the program annually selects discipline tutors from both its faculty and its more advanced students. Furthermore, the Program Council employs junior tutors, selected among the students of the Master's Degree in Chemistry. These tutors are responsible for supporting first- and second-year students in the transition from the high school to the university.

Contacting the "Diritto allo Studio" office, it is possible to apply for student collaborations: https://www.uninsubria.it/servizi/tutti-i-servizi/collaborazioni-studentesche-200-ore

Internship

The Degree Program, in collaboration with the University Offices, supports students in organizing internships. Curricular internships are included in the study plans and take place during the course, also to complete the degree thesis. Their duration is governed by university regulations, in compliance with the applicable national legislation.

The Didactic Secretariat takes care of all the administrative procedures, including the stipulation of individual agreements with companies/public bodies and training project.

Curricular internships provide the recognition of educational credits, which are required for the degree; for this reason, each internship offer will be evaluated by the relevant academic body based on the following aspects: consistency with the student's educational path, validity of the proposal, consistency of duration (number of months and number of hours) with the number of credits required for curricular internships in the specific program.

Art. 8 - Graduation

To get 10 university credits for the training internship, students may perform an experimental work or a bibliographic research on a topic consistent with their curriculum. Both activities are performed under the supervision of a University faculty member (Supervisor) belonging to the CHEM-#, BIOS-07/A, BIOS-08/A, or BIOS-09/A Scientific Sectors. The experimental work may be performed at the Supervisor's research laboratory or at an external public or private organization, subject to an agreement between the organization and the University. To undertake the training internship, students submit a request to the Academic Secretariat. The request is evaluated by the Degree Programme Council. At the end of the internship, the candidate must submit a report describing the performed experimental work and the obtained results.

To get the 3 credits for the Final Exam, the candidate must present and publicly discuss the content of the thesis during one of the graduation sessions scheduled in the academic calendar, before an Admissions Committee composed of at least five professors from the Degree Programme Council. The candidate is admitted to the graduation session upon obtaining all the required credits in the Study Plan (with the exception of those related to the Final Exam). Following the presentation, the Committee has the right to

ask the candidate questions regarding the work.

In a closed session, the Committee assigns the final grade, which is expressed out of 110 and is based on the candidate's academic career assessment based on the average of the exam scores weighted by the credits. Following the Final Exam, this average is increased of 2 points and may be further increased of:

- 1 point if the candidate graduates on time;
- a maximum of 3 points upon the Committee's recommendation;
- a maximum of 4 points upon the Supervisor's recommendation for an experimental activity, or a maximum of 2 points upon the Supervisor's recommendation for a compilation activity.

Upon graduation, a **Diploma Supplement** is issued. The Diploma Supplement is an informative report accompanying the official qualification awarded at the end of the study program. It describes the nature, level, context, content, and status of the studies undertaken and completed by the student. It is issued in both Italian and English. The purpose of the document is to provide independent data for the international transparency of qualifications (diplomas, degrees, certificates, etc.) and to enable equitable academic and professional recognition, promoting student mobility. The Diploma Supplement complies with the Europass standard.

Appendix 1 – Study plan

YEAR I									
SEM	**Name**	**Modules**	**S.S.D**	**S.S.D. 2025**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD ***	**Propaedeutics**
I	FUNDAMENTALS OF GENERAL CHEMISTRY		CHIM /03	CHEM-03/A	A / CHEMICAL DISCIPLINES	9	LEZ: 72	V	
A	GENERAL CHEMISTRY COMPLEMENTS		CHIM /03	CHEM-03/A	A + B / CHEMICAL DISCIPLINES + INORGANIC CHEMICAL AND PHYSICAL CHEMICAL DISCIPLINES	6 (3+3)	LEZ: 48 LAB: 24	V	
I	MATHEMATICS 1		MAT/ 05	MATH-03/A	A / MATHEMATICAL, COMPUTER SCIENCE AND PHYSICAL DISCIPLINES	6	LEZ: 24 ESE: 36	V	
I	SCIENTIFIC ENGLISH		L-LIN/12	ANGL-01/C	KNOWLEDGE OF AT LEAST ONE FOREIGN LANGUAGE	3	ESE: 48	V	
II	MATHEMATICS 2		MAT/ 05	MATH-03/A	A / MATHEMATICAL, COMPUTER SCIENCE AND PHYSICAL DISCIPLINES	6	LEZ: 24 ESE: 36	V	MATHEMATICS 1
II	PHYSICS 1		FIS/03	PHYS-03/A	A / MATHEMATICAL, COMPUTER SCIENCE AND PHYSICAL DISCIPLINES	6	LEZ: 48	V	
II	ORGANIC CHEMISTRY 1		CHIM /06	CHEM-05/A	A / CHEMICAL DISCIPLINES	9	LEZ: 72	V	FUNDAMENTALS OF GENERAL CHEMISTRY
II	CHEMICAL THERMODYNAMICS		CHIM /02	CHEM-02/A	A / CHEMICAL DISCIPLINES	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY
	IT SKILLS		NN	NN	F / IT SKILLS	2		I	
YEAR II									
I	PHYSICS 2		FIS/03	PHYS-03/A	A / MATHEMATICAL, COMPUTER SCIENCE AND PHYSICAL DISCIPLINES	6	LEZ: 48	V	PHYSICS 1
I	PHYSICAL CHEMISTRY 1		CHIM /02	CHEM-02/A	A + B / CHEMICAL DISCIPLINES + INORGANIC CHEMICAL AND PHYSICAL CHEMICAL DISCIPLINES	9 (6+3)	LEZ: 72	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	ANALYTICAL CHEMISTRY	ANALYTICAL CHEMISTRY: FOUNDATIONS	CHIM /01	CHEM-01/A	A /CHEMICAL DISCIPLINES	7	LEZ: 56	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
		ANALYTICAL CHEMISTRY: LABORATORY	CHIM /01	CHEM-01/A	A / CHEMICAL DISCIPLINES	5	LAB: 60	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	INORGANIC CHEMISTRY		CHIM /03	CHEM-03/A	B / INORGANIC CHEMICAL AND PHYSICAL CHEMICAL	9	LEZ: 56 LAB: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---

					DISCIPLINES				GENERAL CHEMISTRY COMPLEMENTS
II	ORGANIC CHEMISTRY 2	ORGANIC CHEMISTRY 2: FOUNDATIONS	CHIM /06	CHEM-05/A	A + B / CHEMICAL DISCIPLINES + ORGANIC-CHEMICAL AND BIOCHEMICAL DISCIPLINES	9 (3+6)	LEZ: 72	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS ---------- ORGANIC CHEMISTRY 1
		ORGANIC CHEMISTRY 2: LABORATORY	CHIM /06	CHEM-05/A	B / ORGANIC-CHEMICAL AND BIOCHEMICAL DISCIPLINES	6	LAB: 72	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS ---------- ORGANIC CHEMISTRY 1
II	POLYMER CHEMISTRY AND TECHNOLOGY		CHIM /04	CHEM-04/A	B / CHEMICAL-INDUSTRIAL AND TECHNOLOGICAL DISCIPLINES	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS
YEAR III									
A	INSTRUMENTAL ANALYTICAL CHEMISTRY	INSTRUMENTAL ANALYTICAL CHEMISTRY: FOUNDATIONS	CHIM /01	CHEM-01/A	B /CHEMICAL-ANALYTICAL AND ENVIRONMENTAL DISCIPLINES	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS ---------- ANALYTICAL CHEMISTRY
		INSTRUMENTAL ANALYTICAL CHEMISTRY: LABORATORY	CHIM /01	CHEM-01/A	B / CHEMICAL-ANALYTICAL AND ENVIRONMENTAL DISCIPLINES	6	LAB: 72	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS ---------- ANALYTICAL CHEMISTRY
I	PHYSICAL CHEMISTRY 2		CHIM /02	CHEM-02/A	B / INORGANIC CHEMICAL AND PHYSICAL CHEMICAL DISCIPLINES	9	LEZ: 48 LAB: 36	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS ---------- PHYSICAL CHEMISTRY 1
II	BIOCHEMISTRY		BIO/10	BIOS-07/A	B / ORGANIC-CHEMICAL AND BIOCHEMICAL DISCIPLINES	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY ---------- GENERAL CHEMISTRY COMPLEMENTS
I o II	TO BE CHOSEN AMONG THE ONES IN TABLE A				C / RELATED OR COMPLEMENTARY	18		V	
I o II	ELECTIVE COURSE				D / ELECTIVE	12		V	
I	INTERNSHIP		NN		INTERNSHIP	10			
I	FINAL EXAM		NN		E/FINAL EXAM	3			

I = first semester; II = second semester

1 CFU of lecture (LEZ) = 8 hours; 1 CFU of exercises (ESE) or laboratory (LAB) = 12 hours

G – Judgement V – Exam I – Suitability F – Attendance

TABLE A

YEAR III - CHOOSE COURSES (TAF C) FOR A TOTAL OF 18 CFU

SEM	Name	Modules	S.S.D	S.S.D. 2025	CFU	Hours	VERIFICATION METHOD*	Propaedeutics
II	*GREEN* METHODS IN ANALYTICAL CHEMISTRY		CHIM/01	CHEM-01/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	APPLIED ANALYTICAL CHEMISTRY	APPLIED ANALYTICAL CHEMISTRY: ENVIRONMENT	CHIM/01	CHEM-01/A	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
		APPLIED ANALYTICAL CHEMISTRY: INDUSTRIAL STRATEGIES	CHIM/01	CHEM-01/A	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	MICELLES, COLLOIDS AND SURFACES		CHIM/02	CHEM-02/A	6	LEZ: 40 LAB: 12	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	MOLECULAR PROGRAMMING AND VISUALISATION	MOLECULAR PROGRAMMING AND VISUALISATION: FOUNDATIONS	CHIM/02	CHEM-02/A	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
		MOLECULAR PROGRAMMING AND VISUALISATION: APPLICATIONS	CHIM/02	CHEM-02/A	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	SYNTHESIS TECHNIQUES IN INORGANIC CHEMISTRY		CHIM/03	CHEM-03/A	6	LEZ: 16 LAB: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	CHARACTERIZATION TECHNIQUES IN INORGANIC CHEMISTRY		CHIM/03	CHEM-03/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	PHYSICAL METHODS IN ORGANIC CHEMISTRY		CHIM/06	CHEM-05/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	ORGANIC CHEMISTRY COMPLEMENTS		CHIM/06	CHEM-05/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	APPLIED ORGANIC CHEMISTRY		CHIM/06	CHEM-05/A	6	LEZ: 16 LAB: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS

II	DEVELOPMENT AND OPTIMIZATION IN ORGANIC SYNTHESIS		CHIM/06	CHEM-05/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	FORENSIC CHEMISTRY		CHIM/06	CHEM-05/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	CHEMISTRY AND TECHNOLOGY OF COLORANTS		CHIM/04	CHEM-04/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	CHEMISTRY AND TECHNOLOGY OF FORMULATIONS		CHIM/04	CHEM-04/A	6	LEZ: 16 LAB: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	CHEMISTRY AND TECHNOLOGY OF THE TEXTILE INDUSTRY		CHIM/04	CHEM-04/A	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	WASTE TREATMENT AND WATER PURIFICATION		CHIM/04	CHEM-04/A	6	LEZ: 24 ESE: 36	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
I	FOOD CHEMISTRY AND TECHNOLOGY		ING-IND/27	ICHI-02/B	6	LEZ: 48	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
II	QUALITY AND SAFETY IN INDUSTRY	QUALITY AND SAFETY IN INDUSTRY (MOD. A)	MED/44	MEDS-25/A	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS
		QUALITY AND SAFETY IN INDUSTRY (MOD. B)	MED/44	MEDS-25/B	3	LEZ: 24	V	FUNDAMENTALS OF GENERAL CHEMISTRY --- GENERAL CHEMISTRY COMPLEMENTS

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