DIDACTIC REGULATIONS OF THE DEGREE PROGRAM

MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force since the academic year 2025-2026

ACRONYMS

CCD	[Commissione di Coordinamento Didattico]	Didactic Coordination Commission
CdS	[Corso/i di Studio]	Degree Program
CFU	[Crediti Fromativi Universitari = 1 ECTS]	University training credits
CPDS	[Commissione Paritetica Docenti-Studenti]	Joint Teachers-Students Committee
OFA	[Obblighi Formativi Aggiuntivi]	Additional Training Obligations
SUA-CdS	[Scheda Unica Annuale del Corso di Studio]	Annual single form of the Degree Program
RDA	[Regolamento Didattico di Ateneo]	University Didactic Regulations

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Art. 1
Object

1. These Regulations govern the organisational aspects of the Course of Studies in Molecular and Industrial Biotechnology (Biotecnologie Molecolari e Industriali) (class L-2). The Course of Studies in Molecular and Industrial Biotechnology belongs to the Department of Chemical Sciences and is held in Italian and delivered in conventional mode.

2. The CdS is governed by the Didactic Coordination Commission (CCD), pursuant to Art. 4 of the RDA. Sub-commissions are present, pursuant to Art. 4 of the RDA.

3. The Didactic Regulations are issued in compliance with the relevant legislation in force, the Statute of the University of Naples Federico II, and the RDA.

Art. 2
Training objectives

The course aims to train graduates who, in addition to possessing an adequate basic knowledge of the various sectors of biotechnological sciences, have knowledge that allows them to operate in industrial/social contexts characterized by the production/use of numerous categories of products falling within the field of industrial biotechnology. The student will have to acquire the theoretical and experimental bases of the disciplines aimed at understanding and managing the molecular and industrial applications of biotechnology. The graduate will therefore be able to carry out the activities of the chemical technician, biochemical laboratory technician and technician of the management and control of chemical plants. Graduates will be able to work in biotechnological analysis laboratories, in particular for industrial purposes. By way of example, we recall The control laboratories of the biotechnological industries. The course of study is structured in three years, each divided into two semesters: from the first to the sixth semester, the student progressively matures the fundamental knowledge for the construction of the professional profile, passing from the acquisition of the fundamentals of scientific subjects (mathematics, physics and chemistry), to subjects in the biological field (biology, molecular biology, genetics, microbiology, biochemistry), to specialized subjects (fundamentals of industrial processes, cellular biotechnology, industrial microbiology) with a structure that allows the student to mature in a first phase the various basic concepts and then acquire the most advanced aspects in a second phase. In this second phase, the student is therefore called upon to expand the framework of knowledge of other disciplines starting from the basic concepts of the same. By way of example, we recall: the evolution of the study of chemistry, which develops from the first semester ("General Chemistry"), extends to the second semester ("Organic Chemistry") and is aimed at the biological field in the third semester ("Biochemistry" and "Molecular Biotechnology") and the analytical aspects in the fifth semester ("Bioanalytical Chemistry"); the study of biology, which develops from the first year ("Biology", "Genetics") to expand with "Molecular Biology" in the third semester and "Applied Genetics" in the sixth; the study of industrial development, which starts from the fourth semester (with "Microbial biotechnologies", "Principles of bioprocess engineering") and expands to the fifth with the introduction of two paths, one molecular and one industrial. The two courses share two courses ("Introduction to biotechnological plants" and "Perception and ethics of industrial biotechnology"), while they differ in other characterizing exams. In addition, the student will be offered a pool of related and supplementary exams and elective exams, to expand the educational offer and direct his preparation according to cultural needs, also according to the continuation of university studies. In this way, the student will have solid preparation for the continuation of studies in the Master's Degree Course in Molecular and Industrial Biotechnology. Of relevance is the inclusion of a challenge, aimed at expanding non-disciplinary transversal skills, and in particular the ability to work in a team, to effectively communicate the results and to evaluate the implications of the activities in terms of environmental sustainability and impact on the social context. Fundamental in the cultural growth of the student is

the internship scheduled in the last semester. During the internship, the student has the opportunity to apply the concepts acquired during the course of studies in a research chain in groups that carry out activities in the biotechnology field at the University or at institutions or companies.

Art. 3
Professional profile and work opportunities

Through a concrete multidisciplinary and training course, the technical-scientific skills are provided for the use of biological systems, interpreted in a molecular and cellular key, to design and produce new biotechnological products and to develop new eco-compatible bioprocesses. The graduate will be able to work in various biotechnological fields, such as industrial, environmental, molecular, scientific communication.

Name of the figure that the course will form:
Industrial Biotechnologist.

Function in a work context:
Graduates will be able to find a job placement as technicians with mainly executive functions in research and development laboratories in public and private bodies and in the chemical, pharmaceutical, food and biotechnological industries. In particular, they will be able to perform technician functions in the chemical industry for the production of intermediates and products for fine chemicals, in the industry for environmental remediation for the management of bioremediation processes, in the fermentation industry for the production of primary and secondary metabolites. In addition, graduates will be able to work in research and service centers for the development and use of molecular diagnostic kits, for the validation and analysis of biotechnological products, for the performance of services related to the main methodologies of biotechnological analysis and process technologies, for the detection of genetically modified organisms in the agri-food supply chains and in the environment.

Skills associated with the function:
Thanks to the multidisciplinary nature of the degree course's educational offer, graduates have acquired the spectrum of theoretical and practical skills necessary to perform the technical functions mentioned above. In particular, the skills acquired in fermentation chemistry and biotechnology, biochemistry, molecular biology and genetics, process technologies, thermodynamics and transport phenomena, enzymology, industrial microbiology and agri-food technologies provide the graduate with the necessary tools to perform the functions described above.

Career opportunities:
Technical operator in research and development laboratories in public and private bodies, in chemical, pharmaceutical, food, biotechnological industries and in public and private service centers for biotechnology.

The following professions have been selected from the list available in the database. However, this list does not include the specific professions of the graduate of the "L-2 Biotechnology" class. Therefore, these professions must be integrated with the profiles explained above. The course allows students to obtain the qualification for the following regulated professions: graduate agrotechnician, junior biologist, agricultural biotechnologist, graduate agricultural expert.

Art. 4
Admission requirements and knowledge required for access to the Degree Program[1]

The general knowledge required to be admitted to the degree course is that deriving from the

achievement of an upper secondary school diploma or other qualification obtained abroad and recognized as suitable.

In particular, a student who accesses the degree course is required:

1) verbal comprehension of a written text with autonomous ability to rework and synthesize;

2) good logical and methodological skills necessary both to deal with the learning of the lectures and practical exercises of the degree course and in personal study;

3) basic knowledge of general and inorganic chemistry, general physics, mathematics, biology with reference to the contents of the programs in force in secondary education institutions, including elements of computer science.

In this context, the minimum knowledge for access to the degree course is:

- notions of mathematics: main properties of numerical sets; rational equations; Cartesian coordinate systems; decimal and natural logarithms; fundamental elements of analytical geometry and trigonometry;
- notions of physics: elements of fundamentals of mechanics. Shape, mass and weight; action and reaction. Elements of optics and electromagnetism;
- notions of chemistry: matter and states of aggregation, structure of the atom, classification of elements, chemical compounds, elements of organic chemistry (the main functional groups). Elementary knowledge of the main molecules of biological interest (sugars, lipids, proteins, nucleic acids);
- notions of biology: fundamental properties of living organisms, prokaryotes and eukaryotes, structure of the eukaryotic cell, elementary notions on metabolism and enzyme function.

It is also believed that elementary knowledge of the English language is necessary in relation to the ability to understand a written text and knowledge of elementary notions on the use of the main widely used computer programs.

The knowledge required for admission will be verified by means of assessment tests in a manner that is defined in the teaching regulations of the course of study, also according to any local planning of access. Details of the method of verification of knowledge and indications about specific additional training obligations, to be fulfilled in the first year of the course in the event of a non-positive assessment, are reported in the teaching regulations of the course of study.

Art. 5
Procedures for access to the Degree Program (CdS)

Admission to the Degree Programme is scheduled annually by the University's Organizational Structures. The maximum number of students admitted is annually decided by the Structures by May. The knowledge required for access - normally reported in the section Orientation in Input of the site of the CdS - will be verified by means of admission tests with modalities that are defined in the competition notice published every year by July.

Detailed information on the admission test is published on the website of the University and on the website of the CdS.

In the event of negative assessment of the adequate initial preparation regarding knowledge requirements for admission to the Degree Course, the Didactic Coordination Commission assigns specific Additional Formative Obligations (OFAs), indicating the means of verification to be fulfilled within the first year of the course.

Art. 6

Teaching activities and university training credit (Teaching activities and CFU)

Each training activity, prescribed by the CdS detail sheet, is measured in CFU. Each CFU corresponds to 25 hours of overall training commitment[2] per student and includes the hours of teaching activities specified in the curriculum as well as the hours reserved for personal study or other individual training activities.

For the Degree Program covered by this Didactic Regulations, the hours of teaching specified in the curriculum for each CFU, established in relation to the type of training activity, are as follows [3]:

- Lecture or guided teaching exercises: 8 hours per CFU;
- Seminar: 4 hours per CFU;
- Laboratory activities or fieldwork: 12 hours per CFU;

For internship activities, each credit corresponds to 25 hours of overall training commitment [4].

The CFU corresponding to each training activity acquired by the student is awarded by satisfying the assessment procedures (examination, pass mark) indicated in the Course sheet relating to the course/activity attached to these Didactic Regulations.

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[2] According to Art. 5, c. 1 of Italian Ministerial Decree No 270/2004, "25 hours of total commitment per student correspond to university training credits; a ministerial decree may justifiably determine variations above or below the aforementioned hours for individual classes, by a limit of 20 per cent".

[3] The number of hours considers the instructions in Art. 6, c. 5 of the RDA: "of the total 25 hours, for each CFU, are reserved: a) 5 to 10 hours for lectures or guided teaching exercises; b) 5 to 10 hours for seminars; c) 8 to 12 hours for laboratory activities or fieldwork, except in the case of training activities with a high experimental or practical content, and subject to different legal provisions or different determinations by DD.MM.".

[4] For Internship activities (Inter-ministerial Decree 142/1998), subject to further specific provisions, the number of working hours equal to 1 CFU may not be less than 25.

Art. 7
Description of teaching methods

Teaching is carried out in presence. If necessary, the CCD decides which class may also include teaching activities offered online. Some lectures may also take place in seminar form and/or involve classroom exercises, language and computer laboratories. Detailed information on how each course is done can be found on the course website.

Art. 8
Testing of training activities[5]

1. The CCD, within the prescribed regulatory limits[6], establishes the number of examinations and other means of assessment that determine the acquisition of credits. Examinations are individual and may consist of written, oral, practical, graphical tests, term papers, interviews, or a combination of these modes.
2. The examination procedures published in the course sheets and the examination schedule will be made known to students before the start of classes on the Department's website.[7]
3. Examinations are held subject to booking, which is made electronically. In case the student is unable to book an exam for reasons that the President of the Board considers justifiable, the student may still be admitted to the examination, following those students already booked.
4. Before examination, the President of the Board of Examiners verifies the identity of the student, who must present a valid photo ID.
5. Examinations are marked out of 30. Examinations involving an assessment out of 30 shall be passed with a minimum mark of 18; a mark of 30 may be accompanied by honours by a unanimous vote of the Board. Examinations are marked out of 30 or with a simple pass mark. Assessments following tests other than examinations are marked out with a simple pass mark.
6. Oral exams are open to the public. If written tests are scheduled, the candidate has the right to see his/her paper(s) after correction.
7. The University Didactic Regulations govern Examination Boards[8].

[5] Article 22 of the University Didactic Regulations.

[6] Pursuant to the DD.MM. 16.3.2007 in each Degree Programs the examinations or profit tests envisaged may not be more than 20 (Bachelor's Degrees; Art. 4. c. 2), 12 (Master's Degrees; Art. 4, c. 2), 30 (five-year single-cycle Degrees) or 36 (six-year single-cycle Degrees; Art. 4, c. 3). Pursuant to the RDA, Art. 13, c. 4, "the assessments that constitute an eligibility evaluation for activities referred to in Art. 10, c. 5, letters c), d), and e) of Ministerial Decree no. 270/2004, including the final examination for obtaining the degree, are excluded from the calculation." For Master's Degree Program and single-cycle Master's Degree Program, however, pursuant to the RDA, Art. 14, c. 7, "the assessments that constitute a progress evaluation for activities referred to in Art.10, c. 5, letters d) and e) of Ministerial Decree no. 270/2004 are excluded from the exam count; the final examination for obtaining the Master's Degree and single-cycle Master's Degree is included in the maximum number of exams".

[7] Reference is made to Art. 22, c. 8, of the University Teaching Regulations, which states that "the Department or School ensures that the dates for progress assessments are published on the portal with reasonable advance notice, which normally cannot be less than 60 days before the start of each academic period, and that an adequate period of time is provided for exam registration, which is generally mandatory."

[8] Reference is made to Art. 22, paragraph 4 of the RDA according to which "Examination Boards and other assessments committees are appointed by the Director of the Department or by the President of the School when provided for in the School's Regulations. This function may be delegated to the CCD Coordinator. The Commissions comprise of the President and, if necessary, other professors or experts in the subject. In the case of active courses, the President is the course instructor, and in such cases, the Board can validly make decisions even in the presence of the President alone. In other cases, the President is a professor identified at the time of the Board's appointment. In the comprehensive evaluation of the overall performance at the conclusion of an integrated course, the professors in charge of the coordinated modules participate, and the President is appointed when the Commission is appointed."

Art. 9
Degree Program structure and Study Plan

1. The legal duration of the Degree Program is 3 years. The student must acquire 180 CFU[9], attributable to the following Types of Training Activities (TAF):
   A) basic, 63
   B) characterising, 63
   C) related or complementary, 18
   D) at the student's choice[10], 12
   E) for the final exam, 11
   F) further training activities, 13
2. The degree is awarded after having acquired 180 CFU by passing examinations, not exceeding 20, and the performance of other training activities.
   Unless otherwise provided for in the legal framework of University studies, examinations taken as part of basic, characterising, and related or supplementary activities, as well as activities chosen autonomously by the student (TAF D) are taken into consideration for counting purposes. Examinations or assessments relating to activities independently chosen by the student may be taken into account in the overall calculation corresponding to one unit[11]. Tests constituting an assessment of suitability for the activities referred to in Article 10, paragraph 5, letters c), d) and a) of Ministerial Decree 270/2004[12] are excluded from the count. Integrated Courses comprising of two or more modules are subject to a single examination.
3. In order to acquire the CFU relating to independent choice activities, the student is free to choose among all the Courses offered by the University, provided that they are consistent with the training project. This consistency is assessed by the Didactic Coordination Commission. Also, for the acquisition of the CFU relating to autonomous choice activities, the "passing the exam or other form of profit verification" is required (Art. 5, c. 4 of Ministerial Decree 270/2004).
4. The study plan summarises the structure of the Degree Program, listing the envisaged teachings broken down by course year and, in case, by curriculum. At the end, the propedeuticities envisaged by the Degree Program are listed. The study plan offered to students, with an indication of the scientific-disciplinary sectors and the area to which they belong, of the credits, of the type of educational activity, is set out in Annex 1 to these Didactic Regulations.
5. Pursuant to Art. 11, paragraph 4-bis, of Ministerial Decree 270/2004, it is possible to obtain the Degree according to an individual study plan that also includes educational activities different

[9] The total number of CFU for the acquisition of the relevant degree must be understood as follows: six-year single-cycle Degree, 360 CFU; five-year single-cycle Degree, 300 CFU; Bachelor's Degree, 180 CFU; Master's Degree, 120 CFU.
[10] Corresponding to at least 12 ECTs for Bachelor's Degrees and at least 8 CFU for Master's Degrees (Art. 4, c. 3 of Ministerial Decree 16.3.2007).

[11] Pursuant to the D.M. 386/2007.
[12] Art. 10, c. 5 of Ministerial Decree. 270/2004: "In addition to the qualifying training activities, as provided for in paragraphs 1, 2 and 3, Degree Programs shall provide for: a) training activities autonomously chosen by the student as long as they are consistent with the training project [TAF D]; b) training activities in one or more disciplinary fields related or complementary to the basic and characterising ones, also with regard to context cultures and interdisciplinary training [TAF C]; c) training activities related to the preparation of the final exam for the achievement of the degree and, with reference to the degree, to the verification of the knowledge of at least one foreign language in addition to Italian [TAF E]; d) training activities, not envisaged in the previous points, aimed at acquiring additional language knowledge, as well as computer and telematic skills, relational skills, or in any case useful for integration in the world of work, as well as training activities aimed at facilitating professional choices, through direct knowledge of the job sector to which the qualification may give access, including, in particular, training and guidance programs referred to in Decree no. 142 of 25 March 1998 of the Ministry of Labour [TAF F]; e) in the hypothesis referred to in Article 3, paragraph 5, training activities relating to internships and apprenticeships with companies, public administrations, public or private entities including those of the third sector, professional orders and colleges, on the basis of appropriate agreements".

from those specified in the Didactic Regulations, as long as they are consistent with the CdS detail sheet of the academic year of enrollment. The individual study plan is approved by the CCD.

Art. 10
Attendance requirements[13]

1. In general, attendance of lectures is strongly recommended but not compulsory. In the case of individual courses with compulsory attendance, this option is indicated in the relative teaching/activity course sheet available in Annex 2. In view of the type of educational organisation provided for in this Regulation, compulsory attendance at all training activities may be required. In particular, for courses that include laboratory activities, attendance at least 70% of them is a prerequisite for access to the evaluation. For courses in which the verification of profit includes ongoing assessments, with tests to be carried out during the course, the prerequisite to access the assessment is to have carried out at least 70% of the tests.
2. If the lecturer envisages a different syllabus modulation for attending and non-attending students, this is indicated in the individual Course details published on the CdS web page and on the teacher's UniNA website.
3. Attendance at seminar activities that award training credits is compulsory. The relative modalities for the attribution of CFU are the responsibility of the CCD.

Art. 11
Prerequisites and prior knowledge

1. The list of incoming and outgoing propedeuticities (necessary to sit a particular examination) can be found at the end of Annex 1 and in the teaching/activity course sheet (Annex 2).
2. Any prior knowledge deemed necessary is indicated in the individual Teaching Schedule published on the course webpage and on the teacher's UniNA website.

Art. 12
Degree Program Calendar

The Degree Program calendar can be found on the Department's website well before the start of the activities (Art. 21, c. 5 of the RDA).

Art. 13
Criteria for the recognition of credits earned in other Degree Programs in the same Class[14]

For students coming from Degree Programs of the same Class, the Didactic Coordination Commission ensures the full recognition of CFU, when associated with activities that are culturally compatible with the training Degree Program, acquired by the student at the originating Degree Program, according to the criteria outlined in Article 14 below. Failure to recognise credits must be adequately justified. It is without prejudice to the fact that the number of credits relating to the same scientific-disciplinary sector directly recognised by the student may not be less than 50% of those previously achieved.

[13] Art. 22, c. 10 of the University Didactic Regulations.
[14] Art. 19 of the University Didactic Regulations.

Article 14

Criteria for the recognition of credits acquired in Degree Programs of different classes, in university or university-level Degree Programs, through single courses, at online Universities and in international Degree Programs[15]; criteria for the recognition of credits acquired in extra-curricular activities

1. With regard to the criteria for the recognition of CFU acquired in Degree Programs of different Classes, in university or university-level Degree Programs, through single courses, at online Universities and in International Degree Programs, the credits acquired are recognised by the CCD on the basis of the following criteria:
   - analysis of the activities carried out;
   - evaluation of the congruity of the disciplinary scientific sectors and of the contents of the training activities in which the student has earned credits with the specific training objectives of the Degree Program and of the individual training activities to be recognised.

   Recognition is carried out up to the number of credits envisaged by the didactic system of the Degree Program. Failure to recognise credits must be adequately justified. Pursuant to Art. 5, c. 5-bis, of Ministerial Decree 270/2004, it is also possible to acquire CFU at other Italian universities on the basis of agreements established between the concerned institutions, in accordance with the regulations current at the time [16].
2. Any recognition of CFU relating to examinations passed as single courses may take place within the limit of 36 CFU, upon request of the interested party and following the approval of the CCD. Recognition may not contribute to the reduction of the legal duration of the Degree Program, as determined by Art. 8, c. 2 of Ministerial Decree 270/2004, except for students who enrol while already in possession of a degree of the same level[17].
3. With regard to the criteria for the recognition of CFU acquired in extra-curricular activities, pursuant to Art. 3, par. 2, of Ministerial Decree (D.M.) 931/2024, within the limit of 48 CFU (Bachelor's Degrees and single-cycle Master's Degrees), the following activities may be recognised (Art. 2 of D.M. 931/2024):
   - Professional knowledge and skills, certified in accordance with the current regulations as well as knowledge and skills acquired in post-secondary-level training activities.
   - Training activities carried out in the cycles of study at the public administration training institutions as well as knowledge and skills acquired in post-secondary-level training activities, which the University contributed to developing and implementing.
   - Achievement of an Olympic or Paralympic medal or the title of absolute world champion, absolute European champion or absolute Italian champion in disciplines recognized by the Italian National Olympic Committee or the Italian Paralympic Committee.

Art. 15

Criteria for enrolment in individual teaching courses

Enrolment in individual teaching courses, provided for by the University Didactic Regulations[18], is governed by the "University Regulations for enrolment in individual teaching courses activated as part of the Degree Program"[19].

[15] Art. 19 and Art. 27, c.6 of the University Didactic Regulations.
[16] Art. 6, c. 9 of the University Didactic Regulations.
[17] Art. 19, c. 4 of the University Didactic Regulations.
[18] Art. 19, c. 4 of the University Didactic Regulations.
[19] R.D. No. 348/2021.

Article 16
Features and modalities for the final examination

The final exam for the achievement of the Degree in Molecular and Industrial Biotechnology will consist of the preparation, presentation and discussion before a special Commission of a written paper that focuses on a topic relevant to the field of industrial biotechnology, deepened by the student during the internship at university facilities or institutions or companies. The final exam is a public discussion of the paper, which is an important demonstration of the cultural maturity achieved by the student as well as his ability to independently and critically elaborate the topic developed. The paper will deal with a topic related to one of the basic, characterizing, similar or supplementary scientific-disciplinary sectors, or, in any case, consistent with the educational objectives of the Degree Course. To access the final examination, the student must have acquired the number of university credits required by the teaching regulations, minus those required for the final examination and english knowledge (11 CFU).

The candidate is allowed to draw up a summary booklet, to be delivered in copy to each member of the Commission. At the end of the presentation, each member of the Commission may address observations to the candidate, relating to the topic of the thesis work. The evaluation of the candidate is also based on the presentation of the paper and the subsequent discussion, taking into account communication skills, learning skills and autonomy of judgment.

Article 17
Guidelines for traineeship and internship

1. Students enrolled in the Degree Program may decide to carry out internships or training periods with organisations or companies that have an agreement with the University. Traineeship and internship are compulsory and contribute to the award of credits for the other training activities chosen by the student and included in the study plan, as provided for by Art. 10, par. 5, letters d and e, of Ministerial Decree 270/2004[20].
2. The CCD regulates the modalities and characteristics of traineeship and internship with specific regulations.
3. The University of Naples Federico II, through the structures of the University, School, Department ensures constant contact with the world of work to offer students and graduates of the University concrete opportunities for internships and work experience and to promote their professional integration.

Article 18
Disqualification of student status[21]

A student who has not taken any examinations for eight consecutive academic years incurs forfeiture unless his/her contract stipulates otherwise. In any case, forfeiture shall be notified to the student by certified e-mail or other suitable means attesting to its receipt.

Article 19
Teaching tasks, including supplementary teaching, guidance, and tutoring activities

1. Professors and researchers carry out the teaching load assigned to them in accordance with the provisions of the RDA and the Regulations on the teaching and student service duties of professors and researchers and on the procedures for self-certification and verification of actual performance[22].

[20] Traineeships ex letter d can be both internal and external; traineeships ex letter e can only be external.
[21] Art. 24, c. 5 of the University Didactic Regulations.
[22] R.D No. 2482//2020.

2. Professors and researchers must guarantee at least two hours of reception every 15 days (or by appointment in any case granted no longer than 15 days) and, in any case, guarantee availability by e-mail.
3. The tutoring service has the task of orienting and assisting students throughout their studies and of removing the obstacles that prevent them from adequately benefiting from attending courses, also through initiatives tailored to the needs and aptitudes of individuals.
4. The University ensures guidance, tutoring and assistance services and activities to welcome and support students. These activities are organised by the Schools and/or Departments under the coordination of the University, as established by the RDA in Article 8.

Article 20
Evaluation of the quality of the activities performed

1. The Didactic Coordination Commission implements all the quality assessment forms of teaching activities envisaged by the regulations in force according to the indications provided by the University Quality Presidium.
2. In order to guarantee the quality of teaching to the students and to identify the needs of the students and all stakeholders, the University of Naples Federico II uses the Quality Assurance (QA)[23] System, developed in accordance with the document "Self-evaluation, Evaluation and Accreditation of the Italian University System" of ANVUR, using:
   - surveys on the degree of placement of graduates into the world of work and on post-graduate needs;
   - data extracted from the administration of the questionnaire to assess student satisfaction for each course in the curriculum, with questions relating to the way the course is conducted, teaching materials, teaching aids, organisation, facilities.

   The requirements deriving from the analysis of student satisfaction data, discussed, and analysed by the Teaching Coordination Committee and the Joint Teachers' and Students' Committee (CPDS), are included among the input data in the service design process and/or among the quality objectives.
3. The QA System developed by the University implements a process of continuous improvement of the objectives and of the appropriate tools to achieve them, ensuring that planning, monitoring, and self-assessment processes are activated in all the structures to allow the prompt detection of problems, their adequate investigation, and the design of possible solutions.

Article 21
Final Rules

The Department Council, on the proposal of the CCD, submits any proposals to amend and/or supplement these Rules for consideration by the Academic Senate.

Article 22
Publicity and Entry into Force

1. These Rules and Regulations shall enter into force on the day following their publication on the University's official notice board; they shall also be published on the University website. The same forms and methods of publicity shall be used for subsequent amendments and additions.

[23] The Quality Assurance System, based on a process approach and adequately documented, is designed in such a way as to identify the needs of the students and all stakeholders, and then translate them into requirements that the training offer must meet.

2. Annex 1 (CdS structure) and Annex 2 (Teaching/Activity course sheet) are integral parts of this Didactic Regulations.

ANNEX 1.1

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

STUDY PLAN

LEGEND

Type of Educational Activity (TAF):

A = Basic
B = Characterising
C = Related or Supplementary
D = At the student's choice
E = Final examination and language knowledge
F = Further training activities

Title Course	SSD	Module	Credits	Hours	Type Activities	Course Modalities	TAF	Disciplinary area	Mandatory/ optional
Year I									
Mathematics and Elements of Statistics	MAT/08 MATH-05/A	single	9	72	Frontal lessons	In-person	A	Mathematics, physics, informatics and statistics	Mandatory
General Chemistry	CHIM/03 CHEM-03/A	single	9	76	Frontal lessons, exercises and laboratory	In-person	A	Chemical disciplines	Mandatory
Introduction to the Biotechnology and Biology	BIO/13 BIOS-10/A	single	9	72	Frontal lessons	In-person	A	Biological disciplines	Mandatory
Physics and computer laboratory	FIS/07 PHYS-06/A	single	9	72	Frontal lessons	In-person	A	Mathematics, physics, informatics and statistics	Mandatory
Organic Chemistry	CHIM/06 CHEM-05/A	single	9	76	Frontal lessons and laboratory	In-person	A	Chemical disciplines	Mandatory
Genetics	BIO/18 BIOS-14/A	single	6	48	Frontal lessons	In-person	A	Biological disciplines	Mandatory
English		single	6	48			E		

Title Course	SSD	Module	Credits	Hours	Type Activities	Course Modalities	TAF	Disciplinary area	Mandatory/ optional
Year II									
Biochemistry	BIO/10 BIOS-07/A	Biochemistry of macromolecules and cellular metabolism	6	48	Frontal lessons	In-person	A	Biological disciplines	Mandatory
	BIO/10 BIOS-07/A	Applied Biochemistry	6	52	Frontal lessons, exercises and laboratory	In-person	A	Biological disciplines	Mandatory
General and applied microbiology	BIO/19 BIOS-15/A	single	9	72	Frontal lessons	In-person	B	Biotechnological disciplines with specific purposes: biological and industrial	Mandatory
Nucleic Acids structure and function	BIO/11 BIOS-08/A	single	6	52	Frontal lessons, exercises and laboratory	In-person	C		Mandatory
Molecular Biotechnology	BIO/10 BIOS-07/A	Advanced biochemistry	6	52	Frontal lessons, exercises and laboratory	In-person	B	Common biotechnological disciplines	Mandatory
	BIO/18 BIOS-14/A	Molecular Genetics	6	48	Frontal lessons	In-person	C		Mandatory
Microbial biotechnology Biotechnology of fermentation processes	CHIM/11 CHEM-07/C	Principles of chemistry of fermentation	6	52	Frontal lessons, exercises and laboratory	In-person	B	Common biotechnological disciplines	Mandatory
	CHIM/11 CHEM-07/C	Biotechnology of fermentation processes	6	52	Frontal lessons, exercises and laboratory	In-person	B	Common biotechnological disciplines	Mandatory
Principles of bioprocess engineering	ING-IND/24 ICHI-01/B	single	6	48	Frontal lessons	In-person	C		Mandatory

Title Course	SSD	Module	Credits	Hours	Type Activities	Course Modalities	TAF	Disciplinary area	Mandatory/ optional
Year III									
Perception and ethics of industrial biotechnology	M-FIL/03 PHIL-03/A	single	6	48	Frontal lessons	In-person	B	Disciplines for regulation, economics and bioethics	Mandatory
Introduction to biotechnological installations	ING-IND/25 26	single	6	48	Frontal lessons	In-person	B	Biotechnological disciplines with specific objectives: chemical and pharmaceutical	Mandatory
INDUSTRIAL CURRICULUM									
Industrial enzymology	BIO/10 BIOS-07/A	single	6	48	Frontal lessons	In-person	B	Common biotechnological disciplines	Mandatory
Bioanalytical chemistry	CHIM/01 CHEM-01/A	single	6	48	Frontal lessons	In-person	B	Biotechnological disciplines with specific objectives: chemical and pharmaceutical	Mandatory
Biomolecular methodologies and heterologous expression in plants	BIO/10 BIOS-07/A	Biomolecular methodologies	3	24	Frontal lessons	In-person	B	Common biotechnological disciplines	Mandatory
	AGR/07 AGRI-06/A	Heterologous expression in plants	3	24	Frontal lessons	In-person	B	Common biotechnological disciplines	Mandatory
Exam to be chosen in the list			6 (*)	56	Frontal lessons, exercises and laboratory	In-person	C		Mandatory
Training activities of the student's own choice			12 (+)			In-person	D		Mandatory
Biotechnology Hackathon			3			In-person	F		Mandatory
Orientation towards the world of work			1			In-person	F		Mandatory
Internship			9			In-person	F		Mandatory
Final test			5			In-person	E		Mandatory

Title Course	SSD	Module	Credits	Hours	Type Activities	Course Modalities	TAF	Disciplinary area	Mandatory/ optional
MOLECULAR CURRICULUM									
Principles of enzymology	BIO/10 BIOS-07/A	single	6	48	Frontal lessons	In-person	B	Common biotechnological disciplines	Mandatory
Analytical methods in proteomics and metabolomics	CHIM/01 CHEM-01/A	single	6	48	Frontal lessons	In-person	B	Biotechnological disciplines with specific objectives: chemical and pharmaceutical	Mandatory
Gene expression and regulation	BIO/10 BIOS-07/A	single	6	52	Frontal lessons, exercises and laboratory	In-person	B	Common biotechnological disciplines	Mandatory
Exam to be chosen in the list			6 (*)	56	Frontal lessons, exercises and laboratory	In-person	C		Mandatory
Training activities of the student's own choice			12 (+)			In-person	D		Mandatory
Biotechnology Hackathon			3			In-person	F		Mandatory
Orientation towards the world of work			1			In-person	F		Mandatory
Internship			9			In-person	F		Mandatory
Final test			5			In-person	E		Mandatory

*** List of the exams to be chosen**

Title Course	SSD	Module	Credits	Hours	Type Activities	Course Modalities	TAF	Mandatory/ optional
Molecular approaches to biotechnology	CHIM/02 CHEM-02/A	single	6	56	Frontal lessons, exercises and laboratory	In-person	C	Mandatory
Biostatistics and AI applied to Biotechnology	FIS/07 PHYS-06/A	Data Analysis	3	28	Frontal lessons, exercises and laboratory	In-person	C	Mandatory
	ING-IND/26 ICHI-01/C	Elements of Machine Learning for Biotechnology	3	28	Frontal lessons, exercises and laboratory	In-person	C	Mandatory
Fungi and yeasts biomass valorization for biotechnology applications	AGRI-08/A AGRI-04/A	single	6	56	Frontal lessons, exercises and laboratory	In-person	C	Mandatory

(+) Every year the CCD offers courses available for independent student choice

List of propaedeuticities:

none

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COURSE REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

Course: Mathematics and Elements of Statistics	**Teaching Language:** Italian
SSD (Subject Areas): MAT/08	**CREDITS:** 9
Course year: I	**Type of Educational Activity:** A
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: Development, theoretical analysis and experimental validation of numerical methods for linear algebra, approximation, differential modelling, optimization and scientific calculation. Numerical methods for the treatment of problems in applied science and technology: numerical methods for function approximation, representation, data approximation and analysis, numerical integration.	
Learning objectives: The main target of the course is to lead the student to know and understand the language and basic concepts of mathematics with particular reference to the differential and integral calculus of functions of one variable. To learn how to identify the most appropriate methods to analyse and solve a problem related to the course topics and correctly interpret the results; to know and understand elements of probability calculation, descriptive and inferential statistic topics.	
Pre-requisites: None **Is a pre-requisite for:** None	
Types of examinations and other tests: Written and oral	

ANNEX 2.1

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: General Chemistry	**Teaching Language:** Italian
SSD (Subject Areas): CHEM-03/A	**CREDITS:** 9
Course year: I	**Type of Educational Activity:** A
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The training objectives of the course are fully consistent with the SSD CHEM-03/A declaratory in the following contents: "…the educational-training in basic chemistry and in the general principles of chemical sciences, with special focus on the chemical properties of elements and their compounds, even in mixtures of natural and synthetic compounds".	
Objectives: The course provides the basic knowledge for understanding the principles of chemistry and chemical phenomena, with special focus on: atomic model; bonding and interactions; states of matter; kinetics, electrochemistry and fundamentals of thermodynamics	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Written and oral	

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COURSE REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

Course: Introduction to the Biotechnology and Biology	**Teaching Language:** Italian
SSD (Subject Areas): BIO/13	**CREDITS:** 9
Course year: I	**Type of Educational Activity:** A
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: Structural and functional organization of the cell, intracellular compartments, function of biomolecules, cell cycle and division, cell development and communication.	
Learning objectives: Overall knowledge of biology and biological phenomena. Information on the main fields of Biotechnology applications.	
Pre-requisites: none **Is a pre-requisite for:** none	
Types of examinations and other tests: Written and oral examination	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: PHYSICS AND COMPUTER LABORATORY	**Teaching Language:** Italian
SSD (Subject Areas): PHYS-06/A	**CREDITS**: 9
Course year: I	**Type of Educational Activity**: A
Teaching Methods: in person.	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The course aims to provide skills in the physics of biological systems. These include the application of instruments, techniques, models, and experimental, analytical, and computational methodologies in various contexts such as biological and biotechnological fields.	
Learning objectives: The course aims at providing the student with the basic knowledge of the physics laws also using PC tools and utilities. Special emphasis will be given to the topics of interest in life sciences.	
Pre-requisites: None **Is a pre-requisite for:** None	
Types of examinations and other tests: written and oral examination.	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Organic chemistry	**Teaching Language:** Italian
SSD (Subject Areas): ORGANIC CHEMISTRY, CHEM-05A	**CREDITS:** 9
Course year: I	**Type of Educational Activity:** A
Teaching Methods: In-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: "The scientific disciplinary field is interested [...] in the study of carbon compounds, both of natural and synthetic origin." "The following are the object of study: [...] the elucidation of the mechanisms through which organic compounds are formed and transformed both in the laboratory and in natural and environmental systems, their supramolecular interactions, the structural characterization and the structure-reactivity relationships. It deals with the isolation of organic substances of animal, plant and marine origin, including those with biological activity, the determination of their structure including stereochemistry […]."	
Objectives: The student must demonstrate knowledge of the main classes of organic compounds, highlighting the relationships between structure, physical properties and chemical behaviour, with particular emphasis on their reactivity. The training - aimed at understanding the molecular basis of processes and interactions between biomolecules, and between biomolecules and the environment - is supplemented by laboratory exercises, aimed at providing familiarity with the handling, analysis and purification of organic compounds. They must be able to recognise the effects that modulate the chemical properties of organic compounds, predict their behaviour under certain environmental conditions and describe the main conversions of functional groups, rationalising possible strategies for the synthesis of more complex substrates from simple molecules.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral interview. Discussion of laboratory reports.	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: GENETICS	**Teaching Language:** ITALIAN
SSD (Subject Areas): BIOS-14/A ex BIO18	**CREDITS:** 6
Course year: I	**Type of Educational Activity: A**
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Understanding, knowledge and acquisition of methodological tools related to the mechanisms that regulate the transmission of genetic traits in procaryotes and eukaryotes cells, individuals and populations. Structure of the genetic material; regulation of gene expression; mechanisms of mutagenesis and evolution.	
Objectives: Knowledge and basic methodological tools necessary to analyse the transmission of genetic traits. The methodological tools will be acquired through the description and analysis of genetic experiments and the knowledge will be acquired through the interpretation of the experimental results. These tools will allow students, through the application of logical-deductive principles, to understand the causes of the main problems of formal and molecular genetics and to understand their evolutionary implications	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral examination	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Biochemistry	**Teaching Language:** Italian
SSD (Subject Areas): BIOS-07/A ex BIO/10 BIOS-07/A ex BIO/10	**CREDITS:** 6 6
Course year: II	**Type of Educational Activity:** A
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Properties of the chemical constituents of living matter. Structure and properties of simple molecules (amino acids) and complex molecules (protein macromolecules). Functions and bio-transformations of chemical constituents, molecular mechanisms and regulation of bio-transformations; bioenergetics, enzymes, metabolic pathways and their regulation. Study of biochemical methodologies for the identification and characterization of protein biomolecules.	
Objectives: The student will acquire knowledge on the concept of structure-function relationship associated with proteins. An integral part of the course is the description of enzymes, the meaning of enzymatic catalysis and inhibition as well as the study of the main metabolic pathways, their interconnection and the mechanisms that regulate their activation and inhibition in response to specific cellular needs. Furthermore, the student will acquire the basic knowledge on protein purification both at a theoretical and practical level.	
Propaedeuticities: none **Is a propaedeuticity for:** none	
Types of examinations and other tests: Oral exam carried out at the same time for the two teaching modules.	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: **GENERAL AND APPLIED MICROBIOLOGY**	**Teaching Language:** **Italian**
SSD (Subject Areas): **BIOS-15/A**	**CREDITS: 9**
Course year: II	**Type of Educational Activity: B**
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: The sector is interested in scientific and educational-training activity in the field of microbiology and microbial biotechnologies, regarding the structure, physiology, metabolism, functional genomics and phylogeny of microorganisms, including viruses. The sector also deals with i) the distribution of microorganisms in nature, the role they play in the host or in the environment, their interactions and complex microbial communities (microbiota/microbiome, virome, biofilm), ii) the mechanisms of action of antimicrobials and resistance to them, iii) of the use and manipulation of microorganisms for application purposes.	
Learning objectives: The training objective of the course is to provide basic knowledge of microorganisms and their biotechnological applications.	
Pre-requisites: **NONE** **Is a propaedeuticity for:** **NONE**	
Types of examinations and other tests: **Written and oral test**	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Structure and function of nucleic acids	**Teaching Language:** Italian
SSD (Subject Areas): BIOS-07/A	**CREDITS:** 6
Course year: II	**Type of Educational Activity: B**
Teaching Methods: In-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Study of the structure, properties, intracellular localizations and functions of nucleic acids, as well as the molecular and enzymatic mechanisms of the conservation and expression of genes. Furthermore, biochemical methodologies for the identification and structural and functional characterization of biomolecules are specific to the sector.	
Objectives: The purpose of this course is to give the bases to correctly understand the structural organization of the gene and the molecular mechanisms which rule its function.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral exam	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Molecular Biotechnology	**Teaching Language:** Italian
SSD (Subject Areas): BIO10 BIO18	**CREDITS:** 6 6
Course year: II	**Type of Educational Activity:** **B** **B**
Teaching Methods: in person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Structural proteins and their function, cell signalling, intracellular communication and the main biomolecules involved, the main signal transduction pathways, and regulation of cell proliferation. Programmed cell death. Classical and molecular methodologies of genetics and use of bioinformatics tools. From gene to the genome, gene expression, mutation mechanisms and DNA repair. Epigenetic regulation. Functional genomics for studying complex biological phenomena and mechanisms for their understanding and manipulation for application purposes. Genetic basis of the immune response and carcinogenesis. Applications at the biotechnological and environmental level of Genetics.	
Objectives: Acquisition by the student of basic knowledge of the main molecular mechanisms responsible for the regulation of cell proliferation and cell-to-cell communication mediated by extracellular signals. The objective of the course is to provide students with the basic knowledge and methodological tools necessary to analyze complex biological phenomena through molecular genetics tools. Reverse genetics, the student will be able to understand and describe the functioning of a cell and an experimental model system while learning and using the main techniques of Molecular Biotechnology.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: The exam for both modules is delivered in oral mode on the same day, in the same class.	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Microbial biotechnology	**Teaching Language:** Italian
SSD (Subject Areas): CHIM/11 CHIM/11	**CREDITS:** 6 6
Course year: II	**Type of Educational Activity:** **B** **B**
Teaching Methods: In-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The disciplinary scientific sector deals with research topics functional to the study and implementation of industrial processes that use microorganisms, microbiota, cell cultures, and microbial enzymes to produce and transform chemical substances of natural and synthetic origin. To this end, the skills include the genetic improvement of microbial strains of industrial interest also through synthetic biology, the control and validation of fermentation processes and the products obtained concerning the biotechnological processes in use in the pharmaceutical, chemical and food industries, in environmental remediation and in biorefineries.	
Objectives: The course aims to describe the main aspects of setting up biotechnological processes. Different fermentation processes for the industrial production of products of commercial interest are explored	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: written and oral, the tests will be carried out at the same time for the two modules	

ANNEX 2.1

COURSE REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

Course: Principles of Bioprocess Engineering	**Teaching Language:** Italian
SSD (Subject Areas): ING-IND 24	**CREDITS:** 6
Course year: II	**Type of Educational Activity:** C
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: Analysis of the technologies of the biotechnological industry with specific attention to the physical, chemical and biological phenomena that characterize the specific transformations. Analysis of individual stages of biotechnological processes and equipment from a system perspective, using the tools of thermodynamics and chemical kinetics, verifying their compatibility with energy and environmental requirements. Elements of chemical and biochemical kinetics and reactors. Chemical and process thermodynamics: energetic analysis of processes, multi-component systems, chemical equilibria between phases and related applications.	
Learning objectives: The course is aimed at enabling the student to analyse transformations of biotechnological interest, developing its ability to interact with other professionals involved in the industrial application of bioprocesses.	
Pre-requisites: none **Is a pre-requisite for:** none	
Types of examinations and other tests: The exam consists of two written tests during the course, and a final oral test.	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Perception and ethics of industrial biotechnology	T**eaching Language**: Italian
SSD (Subject Areas): M-FIL/03	**CREDITS:** 6
Course year: III	**Type of Educational Activity: B**
Teaching Methods: in-person teaching	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The field includes competences related to the study of human action in its moral, ethical-social and political dimensions. It includes elaborations on the human-environment relationship and reflects on the ethical consequences arising from the development of the sciences	
Objectives: The course contributes to the educational goals of the three-year course in Molecular and Industrial Biotechnology by presenting and exploring in depth the main moral issues related to the fields of synthetic biology, genetic engineering, enhancement biotechnology and food technologies. Specific educational goals are: 1) To acquire an adequate understanding of the ethical-philosophical vocabulary that characterizes the debate on the moral issues raised by biomolecular and industrial biotechnology and genetic engineering; 2) To acquire critical skills for recognizing and elaborating ethical-philosophical arguments, including through direct comparison with philosophical texts; 3) To acquire critical skills for applying learned arguments and concepts to morally relevant case studies.	
Propaedeuticities: None **Is a propaedeuticity for:** **None**	
Types of examinations and other tests: Knowledge, skills and competences will be assessed through an oral examination.	

ANNEX 2.1

COURSE REGULATIONS

BSC IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGIES

CLASS L-2

School: Polytechnique and Basic Sciences

Department: Chemical Science

Regulations in force for the academic year 2025-2026

Course: **ELEMENTS OF BIOTECHNOLOGICAL PLA NTS**	**Teaching Language:** Italian
SSD (Subject Areas): ING-IND/25	**CREDITS:** 6
Course year: III	**Type of Educational Activity: B**
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: The SSD includes the study of methodologies for the design of industrial plants based on chemical-physical transformations of matter aimed at the production of goods, the provision of services and the prevention or mitigation of habitat modifications induced by anthropic activities or settlements. Plant design includes the flowsheet of the process, the selection of the equipment for the progress of the process, the assessment of the design features, the processing of functional diagrams including the protection and control instrumentation, the analysis of risk and environmental protection, the evaluation of costs. For the SSD, the key issues are: the functional design and selection of reactors and equipment for unitary operations and for specific exchange and separation applications; the global vision of the plant and the ability to recompose the different aspects in a project and in a functional scheme; the safety and environmental impact of the plants.	
Learning objectives: The activity is aimed to provide the student the tools to: (i) demonstrate knowledge and ability to understand the issues relating to the correlation between: enzymatic or microbial kinetics, type of reactor (STR and CSTR) used, process productivity; (ii) demonstrate the ability to design bioconversion units on the basis of assigned enzymatic/microbial kinetics and productivity, and extend the methodology to non-simple kinetics; (iii) demonstrate knowledge of upstream and downstream equipment types and design relationships; (iv) design equipment based on equilibrium conditions and transport rate; (v) demonstrate the ability to provide assessments regarding the productivity of a set of equipment starting from the notions regarding the single units.	
Pre-requisites: None **Is a pre-requisite for:** None	
Types of examinations and other tests: Written	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Industrial Enzymology	**Teaching Language:** Italian
SSD: **BIOS-07/A ex BIO/10**	**CREDITS: 6**
Course year: III	**Type of Educational Activity: B**
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Industrial enzymes: production methods and fields of application. Applications of enzymes in the environmental, food, diagnostics, leather, paper, textile, detergent and biofuel industries.	
Objectives: The student will acquire knowledge on how to use enzymes to obtain products and/or to preside over industrial processes.	
Propaedeuticities: **None** **Is a propaedeuticity for:** **None**	
Types of examinations and other tests: Oral interview	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Bioanalytical Chemistry	**Teaching Language:** Italian
SSD (Subject Areas): CHEM-01/A	**CREDITS: 6**
Course year: III	**Type of Educational Activity: B**
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Analytical chemistry deals with issues related to the "development of methodologies and instrumental techniques for qualitative and quantitative compositional determination of chemical systems. Study of all processes and methodologies related to the preanalytic and matrix interference stages; advanced separative techniques, integrated analytical systems, spectroscopic and spectrometric techniques and characterization methods for the natural and productive environment and for safety".	
Objectives: The student will acquire skills and knowledge to understand the problems related to the development, optimization of strumental analysis techniques applied to environmental, clinical, agri-food, industrial fields. The course aims to provide students with the basic knowledge and methodological tools necessary for sample preparation, separation and qualitative and quantitative evaluation of multiresidual analysis of products of biotechnological interest	
Propaedeuticities: **None** **Is a propaedeuticity for:** **None**	
Types of examinations and other tests: Oral interview with evaluation expressed in thirtieth	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Molecular Biology and Heterologous Expression in plants	**Teaching Language:** Italian
SSD (Subject Areas): BIOS-08/A ex BIO/11 AGR-06/A ex AGR/07	**CREDITS:** 3 3
Course year: III	**Type of Educational Activity:** **B** **B**
Teaching Methods: In-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The scientific disciplines encompassed in this course include: • Methodologies for the identification and characterization, both structural and functional, of biomolecules. Recombinant molecular technologies are employed to devise biotechnological applications across a range of sectors, including but not limited to, biomedical, pharmaceutical, agri-food, veterinary, industrial, and environmental. • Genetic, molecular, and biotechnological methodologies that extend to plant tissue culture, regeneration, and genetic manipulations of plant cells and their genome	
Objectives: The educational objectives of the course aim to provide the necessary skills to evaluate the approach and techniques to be applied in solving a basic biological problem; to provide students with knowledge and skills related to the function of DNA sequences, molecular cloning, and their amplification; to teach the application of such knowledge in the biotechnological field, with particular attention to the manipulation of plant genomes through the use of direct and indirect methods of genetic transformation. The course is designed to provide students with the proficiency to execute these procedures and comprehend the scientific theories that underpin them.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral test	

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Principles of Enzymology	**Teaching Language:** Italian	
SSD: **BIOS-07/A ex BIO/10**		**CREDITS: 6**
Course year: III	**Type of Educational Activity: B**	
Teaching Methods: In person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Enzymes and reaction mechanisms. Enzymatic kinetics. Enzyme inhibition and other mechanisms of regulation of enzymatic activities.		
Objectives: Molecular and kinetic aspects of enzymatic catalysis and enzyme regulation.		
Propaedeuticities: **None** **Is a propaedeuticity for:** **None**		
Types of examinations and other tests: Oral interview		

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: **Analytical methods in Proteomics an d Metabolomics**		**Teaching Language:** ITALIAN
SSD: **CHEM 01/A**		**CFU:** **6**
Course year: III	**Type of Educational Activity: B**	
Teaching Methods: In-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Analytical chemistry deals with issues related to the "development of methodologies and instrumental techniques for qualitative and quantitative compositional determination of chemical systems. Study of all processes and methodologies related to the preanalytic and matrix interference stages; advanced separative techniques, integrated analytical systems, spectroscopic and spectrometric techniques and characterization methods for the natural and productive environment and for safety".		
Objectives: The student will be introduced to the main instrumental analytical techniques in the field of proteomics and metabolomics. The student will acquire skills on different analytical methodologies for the preparation of biological samples including methods of protein extraction and metabolites, their separation and identification and quantification by mass spectrometry methodologies integrated with bioinformatics methods. The theoretical methods for analysis with omics approaches in targeted and untargeted modes will be useful to interpret the effects of perturbation of a biological system at a molecular level.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral exam		

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Gene expression and regulation	**Teaching Language:** Italian	
SSD (Subject Areas): BIOS-07/A		**CREDITS:** 6
Course year: III	**Type of Educational Activity: B**	
Teaching Methods: In-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Study of the molecular and enzymatic mechanisms of gene expression and regulation; signal transduction, post-translational modifications. Biochemical methodologies for the identification and structural and functional characterization of biomolecules, and recombinant molecular technologies, are specific to the sector. Biotechnological applications and the development of innovative methods, processes and products in the biomedical, pharmaceutical, agri-food, veterinary, industrial and environmental fields are an integral part of the group.		
Objectives: The course of Advanced Molecular Biology aims at providing a deep overview of the mechanisms that regulate the gene expression from transcription to the RNA- mediated control of translation. Students will also become familiar with advanced approaches in molecular biology methodologies to obtain quantitative data on nucleic acid processing.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral exam		

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DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2024-2025

Course: Physico-chemical methodologies for biotechnology	**Teaching Language:** Italian	
SSD (Subject Areas): CHEM-02/A		**CREDITS:** 6
Course year: III	**Type of Educational Activity:** D	
Teaching Methods: in-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The proposed course is fully consistent with the CHEM-02 declaratory in the following points: development of methodologies and instrumental techniques for the qualitative, quantitative and functional compositional determination of both static and dynamic chemical systems in space/time, in vitro simulations of biological systems, and development and application of theoretical models and chemometric tools for the evaluation of quality and significance of chemical information.		
Objectives: The course contributes to the achievement of the educational objectives of the Degree Course in Biomolecular and Industrial Biotechnology, allowing students to integrate the knowledge already acquired in the molecular field with specific skills on the fundamental aspects of the physical and chemical-physical properties that characterize biological macromolecules and nanomaterials for biotechnological applications. First, the main methods of physico-chemical characterization of biomolecules and nanomaterials (molecular and inorganic) and the relationships between structure/size and functional properties of interest for biotechnological applications will be discussed. The main structural characterization techniques useful for the study and rationalization of biotechnological processes will also be discussed. Spectroscopic approaches will be illustrated through laboratory experiences of biotechnological interest.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: oral		

ANNEX 2.1

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic and Basic Sciences

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Biostatistics and AI applied to Biotechno logy	**Teaching Language:** Italian
SSD (Subject Areas): PHYS-06/A ICHI-01/C	**CFU:** 3 3
Course year: III	**Type of Educational Activity:** C
Method of delivery: In-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Scientific research and educational activities related to the study, development, and technological applications of physical, theoretical, modeling, experimental, and computational methodologies in various fields of life sciences, environment, and cultural heritage. Systematic approach to the study of chemical and physical processes and phenomena involved, aimed at optimization, control, conduction, and digitalization of industrial processes. The qualifying topics concern statistical and probabilistic methods for data analysis and experimental design, including machine learning and artificial intelligence tools. Applications concern operational, energy, economic, and environmental aspects of the biotechnology industry.	
Objectives: (i) Provide the basic elements of statistics. (ii) Prepare the student for the use of statistics for the analysis of experimental data, with particular emphasis on those typically produced in life sciences experiments. (iii) Provide basic knowledge on artificial intelligence with particular emphasis on machine learning techniques of interest for applications in the field of industrial biotechnologies. (iv) Train on the computer implementation of the aforementioned techniques through appropriate programming languages.	
Prerequisites: None **Is propaedeutic to:** None	
Types of examinations and other tests: Written exam on data analysis; Preparation and discussion of a project; Oral exam.	

ANNEX 2.1

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic and Basic Sciences School

Department: Chemical Sciences

Didactic Regulations in force since the academic year 2025-2026

Course: Production and valorization of yeast and f ungal biomasses for biotechnological applicatio ns	**Teaching Language:** Italian	
SSD (Subject Areas): AGRI-08/A		**CREDITS:** 6
Course year: III	**Type (Educational Activity:** C	
Teaching Methods: In-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The disciplinary scientific group is interested in scientific and educational activity in the field of microbiology of agricultural, food and environmental systems, with reference to ecology, diversity, genetics, physiology, biochemistry and taxonomy of microorganisms. Among the research topics, consistent with the Degree Course, we can mention: the valorization of secondary raw materials, the management of surplus and biomass, industrial fermentations and biotechnological processes to produce metabolites for energetic, industrial, food, feed, cosmetic, pharmaceutical and nutraceutical interests.		
Objectives: The course aims, first, to provide skills regarding the study of the genetic diversity and physiology of yeasts and fungi used in biotechnology. In the second part of the course, the main production processes of yeast and fungi biomasses will be described (batch, fed-batch, continuous and solid-state fermentation cultures) also starting from waste substrates.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral test		

ANNEX 2.2

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

<table>
<tr><td colspan="2">Training Activity:
Biotechnology Hackathon</td><td colspan="2">Training Activity Language:
Italian</td></tr>
<tr><td colspan="2">Content of the activities consistent with the training objectives of the course:
Other knowledge useful for the insertion into the world of work; Computer and telematics skills</td><td colspan="2">CFU:
3</td></tr>
<tr><td colspan="3">Course year:
III</td><td>Type of Training Activity: F</td></tr>
<tr><td colspan="4">Teaching Methods:
in-person</td></tr>
<tr><td colspan="4">Objectives:
In collaboration with Federchimica/Assobiotech, a biotechnological issue will be presented to students, and the problem will be analysed through lectures with Professors or stakeholders. Students will develop, in a group, a sustainable production solution or process and present their project at the end of the course.
• collective elaboration of the biotechnology problem
• Project implementation;
• presentation of the final product</td></tr>
<tr><td colspan="4">Propaedeuticities:
None
Is a propaedeuticity for:
None</td></tr>
<tr><td colspan="4">Types of examinations and other tests:
Final presentation of the group project</td></tr>
</table>

ANNEX 2.2

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

<table>
<tr><td colspan="2">Training Activity:
Orientation to the world of work</td><td colspan="2">Training Activity Language:
Italian</td></tr>
<tr><td colspan="2">Content of the activities consistent with the tr aining objectives of the course:
Internship</td><td colspan="2">CFU:
1</td></tr>
<tr><td colspan="3">Course year:
III</td><td>Type of Training Activity: F</td></tr>
<tr><td colspan="4">Teaching Methods:
in-person</td></tr>
<tr><td colspan="4">Objectives:
The aim is to provide students with a clear vision of future prospects, both in the field of work and in pursuing their studies. General safety aspects in a laboratory.</td></tr>
<tr><td colspan="4">Propaedeuticities:
None
Is a propaedeuticity for:
None</td></tr>
<tr><td colspan="4">Types of examinations and other tests:
Frequency</td></tr>
</table>

ANNEX 2.2

DEGREE PROGRAM DIDACTIC REGULATIONS

DEGREE IN MOLECULAR AND INDUSTRIAL BIOTECHNOLOGY

CLASS L-2

School: Polytechnic School and Basic Sciences

Department: Chemical Sciences

Regulations in force for the academic year 2025-2026

<table>
<tr><td colspan="2">Training Activity:
Internship</td><td colspan="2">Training Activity Language:
Italian</td></tr>
<tr><td colspan="2">Content of the activities consistent with the tr aining objectives of the course:
Internship</td><td colspan="2">CFU:
9</td></tr>
<tr><td colspan="3">Course year:
III</td><td>Type of Training Activity: F</td></tr>
<tr><td colspan="4">Teaching Methods:
in-person</td></tr>
<tr><td colspan="4">Objectives:
Learning analytical methodologies and instrumental techniques with reference to specific research projects.</td></tr>
<tr><td colspan="4">Propaedeuticities:
None
Is a propaedeuticity for:
None</td></tr>
<tr><td colspan="4">Types of examinations and other tests:
Frequency</td></tr>
</table>