



UNIVERSITÀ DEGLI STUDI DI PALERMO

Department: Engineering

A.Y. 2023/2024

DEGREE COURSE IN CHEMICAL AND BIOCHEMICAL ENGINEERING

Characteristics



Class of Bachelor's Degree
(BSc) on Industrial
engineering (L-9)



3 YEARS



PALERMO



FREE ACCESS



2211

Educational objectives

The 1st cycle Degree Course in Chemical and Biochemical Engineering aims at training technicians able to face in a group context problems in the chemical-physical, biochemical or biotechnological fields integrating competences in three fundamental sciences (Physics, Chemistry and Biology) with the general ones of industrial engineering and with the specific chemical engineering one, providing students the knowledge, methods and ability to process reality which facilitate their access in the labour market.

The course, which is not divided in curricula, is therefore designed to integrate the contents of the three fundamental sciences (Physics, Chemistry and Biology), with general industrial engineering skills and specific biochemical contents, thus providing knowledge, methods and elaboration skills favouring graduates' access to the labour market.

The study of basic sciences (Physics, Chemistry and Mathematics) is organised in a way to make students able to use the laws underlying chemical-physical phenomena, highlighting as much as possible their technical-practical implications, and providing the elements of mathematical language and formalism enabling the translation of the studied contents in quantitative terms.

With this objective the first half of the educational programme consists of teachings related to Calculus and Geometry, Physics, Chemistry and Organic Chemistry.

To further enhance the ability to interpret, formalise and solve chemical-physical and biochemical problems of its graduates, the Degree Course integrates the aforementioned basic contents, with teachings in the field of biology, namely biochemistry and microbiology that complete the education of students in basic sciences by offering them the knowledge of the main rules underlying the functioning of living systems.

The above-described contents are integrated by typical Chemical Engineering teachings starting from the second year (Thermodynamics of Chemical and Biochemical Processes, Transportation Phenomena, Chemical and Biochemical Plants, Principles of Chemistry and Industrial Biochemistry), providing also useful knowledge in the design and management of biotechnological and biochemical processes, thanks to fact that the Course teachers focus their research activities on biotechnological fields.

This knowledge is integrated with the typical disciplines of Industrial Engineering such as Construction Theory and Electrical Engineering.

The course programme includes mandatory optional and elective modules, which may be chosen in the class-specific sectors of Industrial Engineering, enabling students to face more specific issues, not only of chemical engineering, but also to other technological fields to which the latter may contribute, such as environmental remediation, renewable energy sources, biomedical engineering.

These further opportunities enable students to deepen and use the concepts, simultaneously integrating all the scales of reality from the molecular to the macro one, to participate profitably in the group management of problems not necessarily limited to the design, optimization and management of chemical-physical and biochemical processes.

Finally, in the area of equipment design and of the study of chemical and biochemical processes, economic, safety, environmental sustainability and professional ethics issues are also considered. These issues are further developed through seminar activities, classified as "other educational activities".

To achieve these training objectives, basic sciences including Physics, Chemistry and Mathematics are studied. The educational objective is to illustrate to the students the laws underlying chemical-physical phenomena, highlighting as much as possible their technical-practical implications and providing the elements of language and mathematical formalism enabling the translation of the studied contents in quantitative terms.

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

With this objective the first half of the educational programme consists of teachings related to Calculus and Geometry, Physics, Chemistry and Organic Chemistry.

To further enhance the ability to deal with chemical-physical and biochemical problems of its graduates, the Degree Course integrates the aforementioned basic contents, with teachings belonging to biology, namely biochemistry and microbiology that complete the education of students in basic sciences by offering them the knowledge of the main rules underlying the functioning of living systems.

The above described contents are integrated by typical Chemical Engineering teachings starting from the second course year (Thermodynamics of Chemical and Biochemical Processes, Transport Phenomena, Chemical and Biochemical Plants, Principles of Chemistry and Industrial Biochemistry), providing also useful knowledge in the design and management of biotechnological and biochemical processes, thanks to the fact that the Course teachers focus their research activities on biotechnological fields.

This knowledge is integrated with the typical disciplines of Industrial Engineering such as Construction Theory and Electrical Engineering.

From this synergy, integrated with elective modules in which it is possible to study more specific contents of chemical and biochemical engineering, further opportunities arise to deepen and use the concepts, simultaneously integrating all the reality scales of from the molecular to macro ones, to fit in profitably into the management of a group not necessarily limited to the design, optimization and management of chemical-physical processes.

Furthermore, in the area of equipment design and the study of chemical and biochemical processes, economic, safety, environmental sustainability and professional ethics are also considered. These problems are further developed with seminar activities given as part of the "other training activities".

For the final test a limited commitment is required corresponding to 3 CFU which consists of an interview. The topic of discussion of the interview is chosen by the student from a list of topics prepared by the course of studies with its own resolution and published at the beginning of A.A. on the website of the course itself.

Professional opportunities

Junior Chemical and Biochemical Engineer

Functions:

Among the main activities carried out by the chemical engineer and junior biochemist it is worth mentioning the following:

- participation in the management of production and transformation processes based on the use of chemical, biochemical and microbiological technologies.
- collaboration in the management and operation of industrial plants for chemical, biotechnological, biochemical, food and pharmaceutical industries, for the production, distribution and use of fuels and biofuels, of energy and for the treatment of wastewater and waste;
- participation in the management and operation of plants for the depollution, for the treatment of fumes and emissions from combustion processes, for waste disposal, for water purification and for the remediation of polluted soils with chemical-physical, biochemical, and microbiological technologies.

It is worth pointing out that better and more important opportunities for professional growth and expansion of skills, specialization, and management of high professional responsibilities in all sectors of the processing and transformation industry previously listed can only be achieved by integrating training through the achievement of a 2nd cycle degree, or anyway through further training activities such as professional 1st level university master courses.

A high capacity for autonomous management of complex problems will be achieved with the attendance of a PhD course and the achievement of the relevant academic qualification.

Skills:

The main competences of the chemical engineer and junior are:

- ability to use the theoretical, logical and formal aspects of mathematics, of the three basic sciences, (chemistry, physics and biology), of the general principles of structural mechanics and electrical engineering, thermodynamics, fluid dynamics, heat and matter transportation phenomena, and of unit operations for the interpretation and description, also through mathematical language, of the chemical-physical, biochemical and microbiological issues involved in industrial processes, in traditional (chemical, petrochemical, oil & gas) as well as in innovative (biotechnologies, materials, water, soil and air purification, green technologies) sectors.
- ability to work profitably in a group to identify, formulate and solve complex problems of the relevant disciplinary field.
- ability to participate in the management of complex and/or innovative systems, processes and services.
- ability to organize independent learning of related problems in the field of chemical and biochemical engineering
- communication skills in the specific professional field.

Professional opportunities:

The junior Chemical and Biochemical Engineer trained in this 1st cycle Degree Course is a professional working in different industrial sector, in the operational management of plants, processes or services based on the use of chemical-physical, biochemical, and microbiological transformation in the contexts of environmental and economic sustainability and safety. The main industrial sectors of reference are the chemical, oil, energy, biotechnological and biochemical, pharmaceutical, agri-food, materials sectors, often characterised by the presence of large industrial groups operating internationally.

Only for some activities, if carried out as freelancers, it may be required to pass the national professional qualification exam for the profession of engineer and to enrol in the specific section of the professional Register.

The main professional opportunities for 1st cycle graduates in Chemical and Biochemical Engineering may be found in:

- Oil and petrochemical companies
- Bio-refineries
- Chemical and agri-food companies
- Electronic companies
- Energy companies
- Companies producing materials
- Biotechnology and pharmaceutical companies
- Industrial and research laboratories.
- technical and legal-technical premises of public administration
- engineering firms, consultancy companies, companies and service companies for environmental protection, materials recycling and safety of processes and systems
- private professional firms.

Final examination features

To obtain the degree, students must have acquired 180 credits including those relating to the final examination, in accordance with the Course Regulations. The final exam offers students the opportunity to try their hand at analysing a topic of application interest in chemical engineering using the knowledge and expertise accumulated during the course to synthesize it and present it in a critical way also through the use of multimedia tools. The final examination consists of an oral test, in accordance with the rules fixed every year by the final examination Regulations, respecting and consistent to the academic schedule, the ministerial requirements and to the relevant Guidelines of the University.

Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
02605 - COMPUTER AIDED DESIGN <i>Ingrassia(PO)</i>	9	1	V	ING-IND/15	B
03675 - GEOMETRY <i>Falcone(PA)</i>	6	1	V	MAT/03	A
19109 - MATHEMATICAL ANALYSIS - INTEGRATED COURSE	12	Ann.	V		
- MATHEMATICAL ANALYSIS - MODULE 1 <i>Corso(RD)</i>	6	1		MAT/05	A
- MATHEMATICAL ANALYSIS - MODULE 2 <i>Vetro(PA)</i>	6	2		MAT/05	A
04677 - ENGLISH LANGUAGE	3	1	G		E
01788 - CHEMISTRY <i>Dispensa(PO)</i>	9	2	V	CHIM/07	A
15540 - PHYSICS I <i>Corso(RU)</i>	9	2	V	FIS/03	A
Stage and others	3				F
Free subjects	6				D
	57				

Subjects 2 ° year	CFU	Sem.	Val.	SSD	TAF
01933 - ORGANIC CHEMISTRY <i>Bruno(PO)</i>	9	1	V	CHIM/06	C
07870 - PHYSICS II <i>De Giovannini(RD)</i>	6	1	V	FIS/01	A
19578 - THERMODYNAMICS OF CHEMICAL AND BIOCHEMICAL PROCESSES <i>Inguanta(PA)</i>	12	1	V	ING-IND/23	B
08559 - BIOCHEMISTRY <i>Giuliano(PA)</i>	6	2	V	BIO/10	C
06313 - MECHANICS OF MATERIALS AND THEORY OF STRUCTURES <i>Borino(PO)</i>	9	2	V	ICAR/08	B
19577 - PRINCIPLES OF CHEMICAL AND BIOCHEMICAL ENGINEERING <i>Tamburini(PA)</i>	12	2	V	ING-IND/24	B
	54				

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

Subjects 3 ^o year	CFU	Sem.	Val.	SSD	TAF
01814 - APPLIED CHEMISTRY <i>Dintcheva(PA)</i>	9	1	V	ING-IND/22	B
19575 - CHEMICAL AND BIOCHEMICAL PLANTS <i>Scargiali(PA)</i>	12	1	V	ING-IND/25	B
02965 - ELECTRICAL DEVICES AND CIRCUITS <i>Romano(PA)</i>	9	1	V	ING-IND/31	B
05193 - MICROBIOLOGY <i>Quatrini(PA)</i>	6	2	V	BIO/19	C
19574 - PRINCIPLES OF INDUSTRIAL CHEMISTRY AND BIOCHEMISTRY <i>Scialdone(PO)</i>	12	2	V	ING-IND/27	B
05917 - FINAL EXAMINATION	3	2	V		E
Optional subjects	6				B
Stage and others II	6				F
Free subjects II	6				D

69

OPTIONAL SUBJECTS

Stage and others	CFU	Sem.	Val.	SSD	TAF
11034 - OTHER EDUCATIONAL ACTIVITIES - 1 CREDIT	1	1	G		F
11035 - OTHER EDUCATIONAL ACTIVITIES - 2 CREDITS	2	1	G		F
11036 - OTHER EDUCATIONAL ACTIVITIES - 3 CREDITS	3	1	G		F
07576 - PROFESSIONAL PRACTICE 2	2	1	G		F
07599 - PROFESSIONAL PRACTICE 3	3	1	G		F
Stage and others II	CFU	Sem.	Val.	SSD	TAF
21167 - INTERNSHIP 2 CREDITS	2	1	G		F
11033 - INTERNSHIP 3 CREDITS	3	2	G		F
21164 - OTHER ACTIVITIES - 1 CREDIT	1	1	G		F
21168 - OTHER ACTIVITIES - 2 CREDITS	2	1	G		F
21169 - OTHER ACTIVITIES - 3 CREDITS	3	1	G		F
Optional subjects	CFU	Sem.	Val.	SSD	TAF
21914 - BIOMEDICAL AND CONTROLLED RELEASE TECHNOLOGIES <i>La Carrubba(PA)</i>	6	2	V	ING-IND/24	B
19576 - COMBUSTION <i>Caputo(PA)</i>	6	2	V	ING-IND/25	B
17523 - MATHEMATICAL MODELS OF CHEMICAL ENGINEERING <i>Micale(PO)</i>	6	2	V	ING-IND/26	B
21913 - MEMBRANE TECHNOLOGIES FOR ENGINEERING <i>Cipollina(PO)</i>	6	2	V	ING-IND/26	B
10068 - TREATMENT PROCESSES OF INDUSTRIAL WASTEWATERS <i>Scialdone(PO)</i>	6	2	V	ING-IND/27	B

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