2013

REPORT

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

School of Engineering and Architecture

Laurea Magistrale (Second cycle degree/Two year Master - 120 ECTS) in Energy Engineering

A.Y. 2013/2014

Programme Director Prof. Vittorio Colombo

Study Programme Report
Energy Engineering
Programme ex D.M. 270/04 - Code 0935 - Class LM-30
School of Engineering and Architecture
Programme Director Prof. Vittorio Colombo

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INDICE

WHAT IS THE STUDY PROGRAMME REPORT?

What is the Study Programme Report?

The Study Programme Report provides updated information which is important for the purposes of Quality Assurance and is published annually by the University of Bologna.

The main aspects of the teaching programme are described in detail, with a view to assuring the principle of transparency and promoting self-assessment and continuous improvement processes.

The document provides a concrete overview of the features and results of the Study Programme for students, families, employers and so on.

For example, regarding the current issue of employment, it describes the learning outcomes and career opportunities; it also includes statistics on the percentage of employed graduates (D.4. Employment situation).

The document is organised into five sections and a glossary:

A. Presentation and prospects

Key information on the Study Programme, including the expected learning outcomes, career opportunities and further studies.

B. Teaching and Learning

The updated course structure diagram with the full titles and listings of the course units and the latest published lecture timetable.

C. Resources and services

The list of teaching staff and their relative curricula, the offices (secretariats), services (work placements) and infrastructures (libraries, laboratories) available to students.

D. The Study Programme in Figures

Key data shows how many students are enrolled, how many have been assigned additional learning requirements, how many drop out after the first year, how many graduate in line with the programme schedule, the opinions of attending and graduating students on the teaching programmes and information concerning graduate employment.

E. Find out more: the quality of your Study Programme

How the quality system applied to your Study Programme works. The quality system of your Study Programme is a set of processes and responsibilities adopted to guarantee the quality of all Study Programmes at the University of Bologna.

NOTES:

- Reports are available for all Study Programmes for which it is possible to enrol in the first year in academic year 2012/2013: the information and data provided is as updated as possible.
- Sections A, B and C provide data for the academic year 2012/2013.
- Section D presents data regarding the Study Programmes in the last three academic years.
- The information and data were taken from the University databases and the reports published by the Statistical Observatory of the University of Bologna and AlmaLaurea, and are updated to **15 June 2012.**

A. PRESENTATION AND PROSPECTS

This section presents the key information concerning the Study Programme, including the expected learning outcomes, career opportunities and further studies, updated to the academic year 2013/2014.

A.1. PRESENTATION

This paragraph provides information on the specific learning outcomes of the Study Programme and the curriculum.

The 2nd cycle degree programme in Energy Engineering aims to provide students with a solid cultural and professional background to operate in highly qualified areas of the specific field.
2nd cycle graduates in Energy Engineering (ISTAT, 2.2.1.9) will have in-depth knowledge of: basic mathematical disciplines, physics, chemistry and computing; engineering disciplines related to fluid dynamics, heat transmission, power and cogenerative energy systems, environmental impact of Energy systems, combustion and fuel production processes; methods of physical and mathematical modelling for the simulation of energy phenomena, components and systems. Graduates will have professional skills in the fields of thermo-fluid dynamics, energy systems and advanced energy technologies.
In particular, they will acquire specific engineering skills in: Applied thermo-fluid dynamics and Thermotechnical systems; Energy systems and thermal machines; electrotechnics, electrical machines and systems; mechanics and the construction of structures and machines; physics and fission and fusion reactor systems; physics and industrial plasma applications; radiation engineering and radio-protection; safety analysis; environmental control. The acquisition of these skills aims to develop problem solving skills in the field of innovative design and management of energy production, transformation and utilisation systems. 2nd cycle graduates in Energy Engineering will be able to apply the analytical tools and knowledge of sector-specific technologies also in other important engineering fields.
To complement this highly flexible, interdisciplinary and common profile, all graduates in Energy Engineering will possess specific skills in two areas, possibly with broad overlaps in common areas of study depending on the choice of course units as recommended under the degree programme.
Among others, the professional figures, with the relative skills described below may be developed:
Design and methodological skills with industrial application in the fields of:
- systems design and thermo-fluid dynamics for energy production and transformation systems from nuclear sources;
- design of innovative thermotechnical systems and high energy-efficient building coating components;
- design of electrical and thermal energy production systems based on renewable sources;
- design, analysis and management of advanced energy systems (complex cycle gas turbines, steam units, combined cycles).
- design and optimised management of cogenerative systems

Design and methodological skills with industrial application in the fields of:
- physical design for energy production and transformation systems from nuclear sources;
- application of modern system and/or process simulation techniques to the design and analysis of nuclear, radiological and advanced electrical systems;
- development of nuclear techniques, radiation and industrial plasma applications;
- design, analysis and management of advanced energy systems (complex cycle gas turbines, steam units, combined cycles);
- design and optimised management of cogenerative systems

The computing and experimental equipment available for use in the university laboratories, which is being further enhanced, allow for the further study of applications in the above fields. Work placements may also be carried out in collaboration with public and private bodies and companies operating in the territory, as well as in university research departments.
The skills learned in the energy engineering study programme, with a solid physics-mathematics-computing base and its strong interdisciplinary nature, can be successfully put to use in the world of work with a high level of skill in the aforementioned engineering sectors or may be further developed by continuing studies to 2nd level Master's Degree level or to PhD programmes.

A.2. ADMISSION REQUIREMENTS

This paragraph provides information on the knowledge required for admission to the Study Programme.

This information is not available in English at this time.

A.3. LEARNING OUTCOMES

This paragraph provides information on the knowledge and skills students will have acquired by the end of the Programme.

KNOWLEDGE AND UNDERSTANDING:
Graduates will possess in-depth knowledge of the methodological and operative aspects of basic science (mathematics, physics, chemistry and computing) and will be able to put them to use in modelling, design, optimisation and testing fields, for specialist and

interdisciplinary application to the advanced areas of many engineering sciences (technical physics, electrotechnics, applied and solid mechanics, energy machines and systems), applying their understanding to the critical analysis and solution of the highly complex problems of energy engineering (thermo-technical and chemical systems, conventional and nuclear energy sources, radioprotection, industrial plasma and radiation applications, innovative electrical technologies, impact of energy systems) and industrial engineering generally.

The achievement of the ability to apply the above knowledge and understanding will be accomplished through the learning activities organised in the "Energy and Nuclear Engineering" programme, supplementary and complementary activities as well as further activities including work placement and laboratories.

The teaching methods include participation in seminars and exercises in the classroom and in the laboratory, individual and group projects, guided self-study and autonomous study.

Assessment of the achievement of the described learning outcomes shall be mainly through tests, written and oral exams and project work.

ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING:

2nd cycle graduates will be able to apply and develop the specialist knowledge acquired in the field of thermo-dynamics, fluid dynamics and heat transmission using critical autonomy to:

- design conventional and innovative domestic and industrial heating systems, considering the current regulations and the continuous technological evolution of the sector;
- design high energy-efficient building coatings and the certification of their thermal performance;
- design electrical and thermal energy production systems based on renewable sources;
- the thermo-fluid dynamic optimisation of heat exchangers and other technological equipment;
- use symbolic and numeric calculation codes to solve problems of fluid dynamics and heat transmission.

2nd cycle graduates will be able to apply and develop the specialist knowledge acquired in the field of thermal and hydraulic machines and fossil fuel combustion energy production systems using critical autonomy for the:

- assessment of performance of gas turbines, combined units, steam and cogenerative units, both in conditions of stationary regime and in conditions which may be required according to variations in the network load;
- modelling and thermo-fluid dynamic simulation of energy production systems and the management and optimisation of machines and measurements to be taken to verify performance, using advanced computerised information systems (clusters);
- comparison of different adjustment strategies for gas turbine, steam and combined cycle units;
- management strategies for cogenerative systems according to input concerning the cost of electrical and thermal energy;
- the study of the environmental impact of the use of energy systems to produce thermal and electrical energy and their management in order to minimise emissions.

2nd cycle graduates will be able to apply and develop the specialist knowledge acquired in the field of electrical energy, using critical autonomy in particular to:

- analyse and develop electrical energy systems, electrical energy production systems based on conventional and renewable sources in the free electricity market;
- study the main problems relative to the use of electrical drives in industrial automation systems;
- use innovative electrical technologies for the production, storage and use of electrical energy, also contributing to advanced research in this sector.

In particular:

- development and application of superconductor materials for electrical equipment;
- electrical problems linked to the design and management of fuel cells and batteries;
- technologies relative to electrostatic charge formation processes;
- electrical problems linked to the design of new types of energy cables;
- analysis of shunt capacitators and energy quality.

2nd cycle graduates will be able to apply and develop the specialist knowledge acquired in the field of nuclear engineering, radiations and plasma, using critical autonomy to:

- exercise the radioprotection profession, after passing the state professional exams to become a "3rd level qualified expert";
- implement systems for the industrial-technological, biological-biomedical use, research and environmental protection of ionising radiations, supervising the design, planning the choices and acquisitions and assuring their management in compliance with applicable legal provisions and the highest professional standards;
- study the issues relative to power generation from nuclear sources and the implications of reactor physics, nuclear systems radiation protection and environmental impact assessment;
- assure the physical design and simulation, experimental analysis and management of thermal plasma sources able to assist the technological processes of the treatment, synthesis and transformation of conventional and innovative materials with high technological added value and interest in the energy field, including quality management and environmental protection;
- describe the behaviour of nuclear fission reactors, the analysis of fusion reactors and, more generally, the modelling of high temperature thermal plasma;

- study the transport phenomena of charged cells and photons in technological and scientific applications, with particular reference to biomedical applications and materials analysis, as well as machines for the production of thermonuclear plasma;
- carry out precise physical modelling for thermo-fluid dynamic and electromagnetic simulation using advanced computerised information systems (clusters), the phenomena which govern processes assisted by high energy sources.

2nd cycle graduates will be able to apply and develop the specialist knowledge acquired in the field of the foundations of process engineering and combustion technologies, using critical autonomy to:
- design biomass and alternative fuel exploitation processes for the production of electricity;
- assure the integrated management of gassy waste treatment processes deriving from stationary combustion systems;
- analyse conventional, hydrogen and fuel cell fuel production processes;
- analyse transport phenomena in fuel cells;
- analyse problems linked to the running and/or design of geothermal energy production plants, plants running on wet and dry scrubbers of gassy effluent in plants based on innovative technologies.

The achievement of the ability to apply the above knowledge and understanding will be accomplished through the learning activities organised in the "Energy and Nuclear Engineering" programme, supplementary and complementary activities as well as further activities including work placement and laboratories.
The teaching methods include participation in seminars and exercises in the classroom and in the laboratory, individual and group projects, guided self-study and autonomous study.
Assessment of the achievement of the described learning outcomes shall be mainly through tests, written and oral exams and project work.

JUDGEMENT SKILLS:
2nd cycle graduates:
- will be able to identify, organise and use the fundamental information required to solve complex theoretical and technical problems in the energy engineering field, even when these relate to issues of technological innovation and theoretical and/or applied research for which the available information is incomplete or still to be consolidated;
- will be able to identify, formulate and solve the highly complex problems of the design, implementation and management of complex systems and high technology industrial products;
- will be able to keep abreast of the developments in methods, techniques and instruments in the energy engineering field, autonomously researching and/or following training courses aimed at the acquisition of additional skills;
- will be able to source, consult and interpret the main technical journals and national, European and international standards in the sector;
- will be able to contribute to updating and revision of the technical standards in the field of interest in a pro-active manner, transferring their advanced knowledge and continuous updating which they will be bound to pursue.

The aforementioned judgement skills are accomplished through the learning activities organised in the "Energy and Nuclear Engineering" programme, as well as further activities including work placement and laboratories and the preparation for the final examination.
The teaching methods include participation in seminars and exercises in the classroom and in the laboratory, individual and group projects, guided self-study and autonomous study.
Assessment of the achievement of the described learning outcomes shall be mainly through tests, written and oral exams and project work.

COMMUNICATION SKILLS:
2nd cycle graduates:
- will be able to effectively communicate information, ideas, problems and solutions orally and in writing both in Italian and at least English, to a high level of knowledge also to sectoral specialists.
- will be able to produce highly technical reports on project work and interpret reports produced by other collaborators, superiors and juniors;
- will be able to participate actively using personal and autonomous initiative in a design group, and may also coordinate the group, identifying the best solutions for the production of advanced and innovative products and processes.

The aforementioned communication skills are accomplished through the participation in core and supplementary learning activities as well as further activities including work placement and laboratories and the preparation for the final examination.
The teaching methods include participation in exercises in the classroom and in the laboratory, individual and group projects and guided self-study.
Assessment of the achievement of the described learning outcomes shall be mainly through written and oral exams and project work.

LEARNING SKILLS:
2nd cycle graduates will have developed a broad cultural basis and a flexible professional approach which allow them to maintain their skills in step with the rapid evolution of the technical and socio- economic world, as well as continue further studies with a high level of autonomy and/or carry out research and development activities, advanced technological applications and/or academic activities.

The aforementioned learning skills are achieved through learning activities in the disciplinary fields laid down in the degree programme system and in particular the activities carried out partly in an autonomous manner.
The specific teaching methodologies include tutorials. Assessment of the achievement of the learning skills shall be through the various exams organised throughout the programme.

A.4. CAREER OPPORTUNITIES

This paragraph provides information on the occupational profile, functions and fields of employment available to graduates of this Programme.

Professional figure:
ENERGY ENGINEER
Main functions:
Occupies positions of responsibility in design, management, coordination and development of industrial and/or research activities in public and private boards and companies, as well as innovative activities within the freelance field. Possesses a broad cultural basis and a flexible professional approach which can be successfully applied to research and development activities and advanced technological applications, not only in the conventional and nuclear energy field but generally in the industrial sector. Specialises knowledge in various sectors, within the following professional profiles.

Professional figure:
ENERGY ENGINEER AND/OR HIGHLY QUALIFIED MANAGER IN THE THERMO-FLUID DYNAMICS DESIGN AREA
Main functions:
In charge of:
- the design of conventional and innovative domestic and industrial heating systems, considering the current regulations and the continuous technological evolution of the sector;
- the design of high energy-efficient building coatings and the certification of their thermal performance;
- the design of electrical and thermal energy production systems based on renewable sources;
- the thermo-fluid dynamic optimisation of heat exchangers and other technological equipment;
- the use of symbolic and numeric calculation codes to solve problems of fluid dynamics and heat transmission.

Professional figure:
EXPERT ENERGY ENGINEER AND/OR HIGHLY QUALIFIED MANAGER IN THE DESIGN OF THERMAL AND HYDRAULIC MACHINES AND ENERGY AND FOSSIL FUEL PRODUCTION SYSTEMS

Main functions:
In charge of:
- the assessment the performance of gas turbines, combined units, steam and cogenerative units, both in conditions of stationary regime and in conditions which may be required according to variations in the network load;
- modelling and thermo-fluid dynamic simulation of energy production systems and the management and optimisation of machines and measurements to be taken to verify performance, using advanced computerised information systems (clusters);
- comparison of different adjustment strategies for gas turbine, steam and combined cycle units;
- management strategies for cogenerative systems according to input concerning the cost of electrical and thermal energy;
- the study of the environmental impact of the use of energy systems to produce thermal and electrical energy and their management in order to minimise emissions.

Professional figure:
EXPERT ENERGY ENGINEER AND/OR HIGHLY QUALIFIED MANAGER IN THE FIELD OF ELECTRICITY PRODUCTION AND CONVERSION
Main functions:
In charge of:
- the analysis and development of electrical energy systems, electrical energy production systems based on conventional and renewable sources in the free electricity market;
- The main problems relative to the use of electrical drives in industrial automation systems;
- the use of innovative electrical technologies for the production, storage and use of electrical energy, also contributing to advanced research in this sector.

In particular:
- development and application of superconductor materials for electrical equipment;
- electrical problems linked to the design and management of fuel cells and batteries;
- technologies relative to electrostatic charge formation processes;
- electrical problems linked to the design of new types of energy cables;
- analysis of shunt capacitators and energy quality.

Professional figure:
EXPERT ENERGY ENGINEER AND/OR HIGHLY QUALIFIED MANAGER IN THE FIELD OF NUCLEAR ENGINEERING, RADIATION AND PLASMA APPLICATIONS
Main functions:
In charge of:
- exercising the radioprotection profession, after passing the state professional exams to become a "3rd level qualified expert";
- the implementation of systems for the industrial-technological, biological-biomedical use, research and environmental protection of ionising radiations, supervising the design, planning the choices and acquisitions and assuring their management in compliance with applicable legal provisions and the highest professional standards;
- the issues relative to power generation from nuclear sources and the implications of reactor physics, nuclear systems radiation protection and environmental impact assessment;
- the physical design and simulation, experimental analysis and management of thermal plasma sources able to assist the technological processes of the treatment, synthesis and transformation of conventional and innovative materials with high technological added value and interest in the energy field, including quality management and environmental protection;
- the description of the behaviour of nuclear fission reactors, the analysis of fusion reactors and, more generally, the modelling of high temperature thermal plasma;
- the study of the transport phenomena of charged cells and photons in technological and scientific applications, with particular reference to biomedical applications and materials analysis, as well as machines for the production of thermonuclear plasma;
- the precise physical modelling for thermo-fluid dynamic and electromagnetic simulation using advanced computerised information systems (clusters), the phenomena which govern processes assisted by high energy sources.
Professional figure:
EXPERT ENERGY ENGINEER AND/OR HIGHLY QUALIFIED MANAGER IN THE FIELD OF PROCESS ENGINEERING AND COMBUSTION TECHNOLOGY APPLICATIONS
Main functions:
In charge of:
- design biomass and alternative fuel exploitation processes for the production of electricity;
- integrated management of gassy waste treatment processes deriving from stationary combustion systems;
- analysis of conventional, hydrogen and fuel cell fuel production processes;
- analysis of transport phenomena in fuel cells;
- analysis of problems linked to the running and/or design of geothermal energy production plants, plants running on wet and dry scrubbers of gassy effluent in plants based on innovative technologies.
Career opportunities:
2nd cycle graduates in Energy Engineering possesses a broad cultural base and a flexible professional approach which can be successfully applied to research and development activities and advanced technological applications, not only in the conventional and nuclear energy field but generally in the industrial sector.
In this sense, Energy Engineering graduates have extremely wide potential for employment in almost all fields of the modern technological society. In fact, all production sectors have to deal with the problem of optimising energy sources and minimising consumption; this is also of primary national interest, given the persistence in Italy of the strong dependency of foreign energy supplies. Furthermore, the advanced industrial field in which the energy engineering graduate will be called to work in demands the capacity to solve problems linked to the analysis and modelling of complex systems, reliability, safety analysis, risk assessment and prevention and environmental impact.
The main career opportunities for Energy Engineering graduates are: services companies; public and private energy procurement companies; producers of electrical and thermo electrical systems and components; energy sector design firms; civil and industrial concerns which require energy managers; research and development centres working in the innovative energy technologies field.
The 2nd cycle degree programme in Energy Engineering aims specifically to train professional figures able to occupy positions of responsibility in the management, coordination and development of industrial and/or research activities in public and private boards and companies, as well as innovative activities within the freelance field.
In particular, there are many important industrial companies which work specifically in sectors in which 2nd cycle energy engineering graduates are able to used their professional skills to fill high level middle and upper management positions, as well as in the public and private research and development fields:
- public and private energy procurement companies; research and development centres working in the innovative energy technologies field;
- suppliers of goods and services in the energy field, Energy Service Companies (ESCO);
- producers of components for heating systems, environmental conditioning systems, industrial refrigeration;
- producers of components for building coatings which require the energy certification of their products;
- laboratories certifying the thermal-physical properties of materials;

- companies working in the design, implementation and installation of thermal and electrical energy production systems based on fossil fuels and renewable sources;
- factories working in the manufacturing, mechanical, chemical, petrochemical and process sectors which require energy managers (mechanics industries, ceramics industries, chemical industries, brickworks, cement works, sugar processing, paper manufacturing, food processing and pharmaceuticals);
- automotive design and production companies;
- industries for the production and management of energy components and systems (turbines, compressors, electricity production plants);
- companies managing waste treatment and disposal plants which include energy recovery processes;
- design firms working in the radiation engineering sector with biological, biomedical and industrial-technological applications;
- design firms working in the thermo-technical plant sector, energy recovery in building complexes, cogeneration and district heating systems, electrical and thermal energy production systems based on renewable sources;
- spa resorts which under Italian law 230/95 and amendments require physical radioprotection monitoring;
- ceramic processing plants subject to physical radioprotection monitoring under Italian law 230/95 and amendments;
- physical radioprotection monitoring in underground working environments subject to Italian law 230/95 and amendments;
- industries using control methods using radiation;
- electro-mechanical sector manufacturers of high technology sources and relative components for metal cutting and welding;
- public and private research bodies working in the advanced electrical technologies sector for the production, transport and storage of electricity (photovoltaic system, fuel cell, superconductors, etc.);
- electrical equipment and machinery production industries.

A.5. OPINION OF SOCIAL PARTNERS AND POTENTIAL EMPLOYERS

This paragraph describes the outcome of the consultation with the representative employment and trade organisations.

This information is not available in English at this time.

A.6. FURTHER STUDIES

It gives access to thirdcycle studies (PhD/Specialisation schools) and to professional master'sprogrammes.

B. TEACHING AND LEARNING

This section describes the updated course structure diagram (for academic year 2013/2014), with the full titles and listings of the course units and the latest published lecture timetable.

B.1. COURSE STRUCTURE DIAGRAM

The link takes you to the Study Programme course structure diagrams. You can also access to each course unit content.

- Study plan: all course units in the programme

B.2. CALENDAR AND LECTURE TIMETABLE

The links take you to the teaching calendar (exam session and final examination session) and the lecture timetable (in Italian).

- Lecture timetable
- Exam sessions
- Final examination sessions

C. RESOURCES AND SERVICES

This section provides a list of teaching staff and their relative curricula and and description of the services available to students for the academic year 2013/2014.

C.1. TEACHERS

The paragraph lists the lecturers who teach in the Study Programme: from here you can access the personal web pages of each one (in Italian). Information updated to 28 May 2013 (in Italian).

Permanent teaching staff:

Barletta, Antonio
Bianchi, Michele
Borghetti, Alberto
Borghi, Carlo Angelo
Breschi, Marco
Cazzoli, Giulio
Ceschini, Lorella
Colombo, Vittorio
De Pascale, Andrea
Fabiani, Davide
Fernandez, Jorge Eduardo
Ghedini, Emanuele
Manservisi, Sandro
Marzani, Alessandro
Morandi, Antonio
Morini, Gian Luca
Mostacci, Domiziano
Munari, Andrea
Pelloni, Piero
Pulvirenti, Beatrice
Rossi di Schio, Eugenia
Saccani, Cesare
Scardovelli, Ruben
Spadoni, Gigliola
Sumini, Marco
Teodori, Francesco
Vestrucci, Paolo
Villa, Mauro
Zanchini, Enzo

C.2. STUDENT SERVICES: OFFICES

C.2.1. FUTURE STUDENTS

The link take you to the webpage which provides specific information about the offices and the services for the future students (in italian).

- Future students

C.2.2. ENROLLED STUDENTS

The link take you to the webpage which provides specific information about the offices and the services for the enrolled students (in italian).

- Enrolled students

C.2.3. INTERNATIONAL STUDENTS

The links take you to the reference Work Placement and International Relations office for the Study Programme, where available.

- International students

C.2.4. GRADUATES

- Graduates

D. THE STUDY PROGRAMME IN FIGURES

Information on students' starting their university careers, how many students are in line with the regular programme, opinions of students and graduates on the teaching programmes and information concerning graduate employment.
This section provides the data of the last academic years for the Study Programme (SP) and a comparison with similar Study Programmes. The University of Bologna has divided its Study Programmes into four groups:

- *BIOMEDICAL group: Study Programmes of the Schools of Pharmacy, Biotechnology and Sport Science; Medicine; Agriculture and Veterinary Medicine*
- *SCIENTIFIC-TECHNOLOGICAL group: Study Programmes of the Schools of Engineering and Architecture; Sciences*
- *SOCIAL SCIENCES group: Study Programmes of the Schools of Economics, Management, and Statistics; Law, Political Sciences*
- *HUMANITIES group: Study Programmes of the Schools of Arts, Humanities, and Cultural Heritage; Foreign Languages and Literatures, Interpreting and Translation; Psychology and Education*

The section presents the results of the Study Programme for the last three academic years.
Main data shows how many students enrolled, the number of students assigned OFA, how many drop out after the first year, how many graduate in line with the programme schedule, the opinions of attending and graduating students on the teaching programmes and information concerning graduate employment.
The information and data presented in this section, updated to 28 May 2013, were taken from University databases and AlmaLaurea.
Study Programmes may be subject to degree programme system modifications from one academic year to the next, and the data provided in this section may refer to a programme with a slightly different system to the one currently running (such as programme title, course structure diagram and list of lecturers). However, indicatively the data presents the general trend of the Study Programme over the past three years.
Most of the Study Programmes running at the University of Bologna have been reformed in compliance with DM 270/04, most of them from the academic year 2008/2009. For this reason for the previous academic years for some information, as opinion of the graduates and employment situation, are provided in the reports of those Programmes, on the paragraph D.5. refers to the Study Programmes as they were presented prior to the reform.

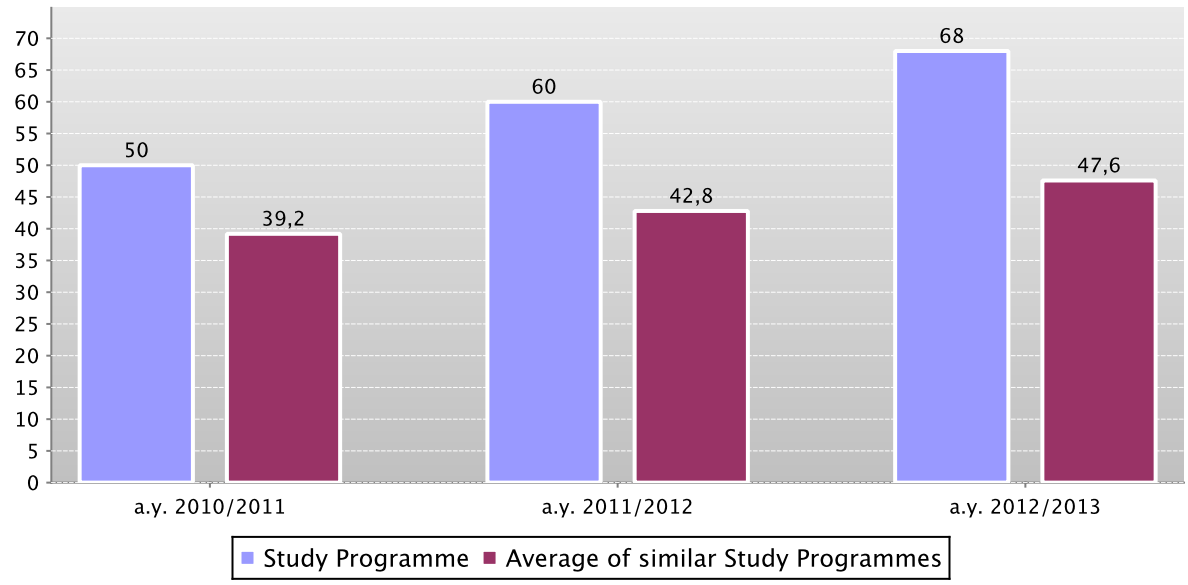
D.1. STUDENTS STARTING THEIR UNIVERSITY CAREERS

Characteristics of incoming students at the beginning of their study. Tables and graphs provide information on number of enrolled students (new careers), focusing on the characteristics of students and results of any entrance tests.

D.1.1. ENROLMENTS

The **graph** and the **table** show the number of new careers of the Study Programme compared with the average of similar Study Programmes (which belong to the same group), for the indicated academic years.

New careers



	a.y. 2010/2011		a.y. 2011/2012		a.y. 2012/2013	
	New careers	Total N. enrolled students	New careers	Total N. enrolled students	New careers	Total N. enrolled students
Study Programme	50	99	60	143	68	165
Average of similar Study Programmes	39,2	60,4	42,8	62,9	47,6	62,6

D.1.2. ADDITIONAL DATA ON STUDENTS' STARTING THEIR UNIVERSITY CAREERS

D.1.2.1. CANDIDATES REGISTERED FOR THE ENTRANCE EXAM

In academic year 2012/2013 access to this Study Programme was not restricted.

D.1.2.2. INCOMING STUDENTS

Geographic origin, type of 1st cycle degree, age and gender of students.
The data shows a homogeneus group of students (cohort) which started together their academic career.
Students which have passed to an other Study Programme, transferred from an other university, or registered to a 2nd degree are not included.
The **tables** show the number, geographic origin, gender, age, type and grade of 1st cycle degree of students enrolling in the degree programme.
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for the indicated academic years.

			Geographic origin					Gender		Average age of new career students		
		New careers	Students coming from the province of the Study Programme site	Students coming from other provinces where Unibo has a site	Students coming from other provinces of Emilia Romagna region	Students coming from other Italian regions	Students coming from abroad	M	F	22 or less	23 - 24	25 or more
Students 2010/2011	Study Programme	50	20,0%	14,0%	24,0%	40,0%	2,0%	80,0%	20,0%	64,0%	32,0%	4,0%
	Average of similar Study Programmes	39,2	26,0%	19,0%	8,2%	42,6%	4,3%	70,2%	29,8%	36,7%	42,3%	21,0%
Students 2011/2012	Study Programme	60	25,0%	21,7%	16,7%	35,0%	1,7%	71,7%	28,3%	56,7%	41,7%	1,7%
	Average of similar Study Programmes	42,8	25,6%	18,3%	8,1%	44,8%	3,2%	66,3%	33,7%	31,2%	46,7%	22,2%
Students 2012/2013	Study Programme	68	27,9%	17,6%	8,8%	44,1%	1,5%	88,2%	11,8%	50,0%	39,7%	10,3%
	Average of similar Study Programmes	47,6	27,9%	18,2%	6,2%	43,2%	4,6%	68,2%	31,8%	32,0%	44,7%	23,3%

		First Cycle Degree: University of previous studies				First Cycle Degree: more frequent class		First Cycle Degree: grade					
		University of Bologna	Other Italian Universities	Foreign University	Other not defined	Class code and name	% of students	First Cycle Degree grade between 66 and 90	First Cycle Degree grade between 91 and 100	First Cycle Degree grade between 101 and 105	First Cycle Degree grade between 106 and 110	First Cycle Degree grade 110 and honors	First Cycle Degree grade not available
Students 2010/2011	Study Programme	90,0%	10,0%			10 INGEGNERIA INDUSTRIALE	90,0%	2,0%	34,0%	26,0%	14,0%	24,0%	
	Average of similar Study Programmes	75,1%	17,9%	0,6%	6,4%	10 INGEGNERIA INDUSTRIALE	25,3%	16,3%	31,8%	16,8%	14,2%	14,5%	6,4%
Students 2011/2012	Study Programme	86,7%	11,7%		1,7%	L-9 INGEGNERIA INDUSTRIALE	60,0%	1,7%	33,3%	25,0%	16,7%	21,7%	1,7%
	Average of similar Study Programmes	71,3%	21,4%	0,4%	6,9%	10 INGEGNERIA INDUSTRIALE	15,9%	15,3%	34,0%	17,7%	13,6%	12,5%	6,8%
Students 2012/2013	Study Programme	92,6%	7,4%			L-9 INGEGNERIA INDUSTRIALE	77,9%	25,0%	33,8%	17,6%	14,7%	8,8%	
	Average of similar Study Programmes	67,6%	15,8%	0,4%	16,3%	L-9 INGEGNERIA INDUSTRIALE	21,0%	16,4%	33,9%	12,8%	11,1%	9,5%	16,3%

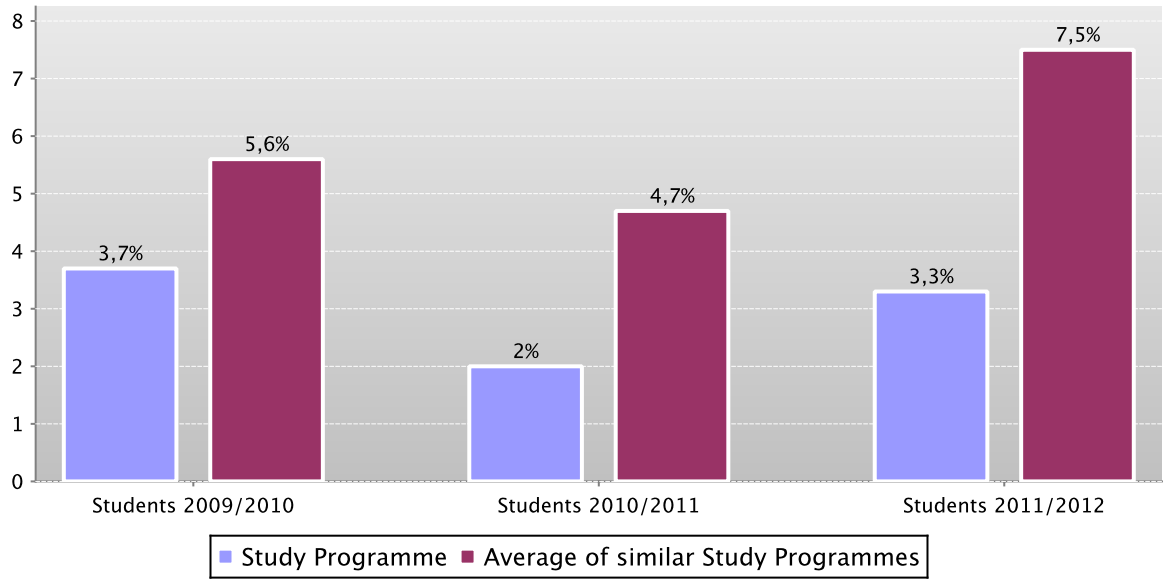
D.2. REGULARITY OF STUDIES

Insight into the regularity with which the students pass their exams. The graphs and the tables provide information on the number of students who leave the programme between the first and second year and the number of regular graduates, focusing on the number of credits obtained at the end of the first year, on the exams passed and average grade achieved for each course unit.

D.2.1. STUDENTS LEAVING THE PROGRAMME BETWEEN YEARS 1 AND 2

Here the number of students leaving the Study Programme is shown.
The **graph** shows the percentage of students who leave the programme after the first year compared to the average of similar Study Programmes (belonging to the same group).
The **table** shows the registered students (new careers), the percentage of students leaving the programme who pass to a different Study Programme in the same university, transfer to another university or withdraw from studies as well as the enrolled repeating students and those enrolled in the second year.
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for students registered (new careers) in the indicated academic years.

Percentage of withdrawals between years 1 and 2

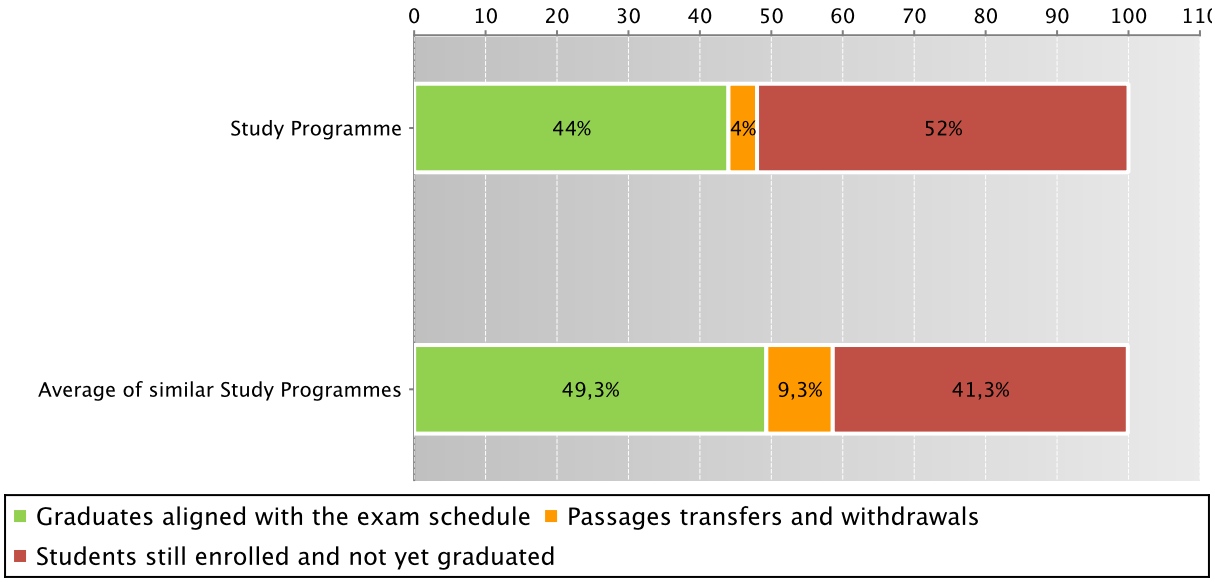


		New careers	% withdrawals	% passages and transfers	% repeating students	Students enrolled in the second year
Students 2009/2010	Study Programme	54	3,7%	9,3%	0,0%	47
	Average of similar Study Programmes	40,5	5,6%	0,8%	0,1%	37,9
Students 2010/2011	Study Programme	50	2,0%	0,0%	0,0%	49
	Average of similar Study Programmes	39,2	4,7%	0,7%	0,0%	37,1
Students 2011/2012	Study Programme	60	3,3%	0,0%	0,0%	58
	Average of similar Study Programmes	42,8	7,5%	1,3%	0,1%	39

D.2.2. REGULAR GRADUATES

Here you will find information on regular graduates, on how many students, at the end of the regular programme duration, left the programme and how many are still enrolled but not aligned to the exam schedule.
The **graph** and the **table** show the situation concerning the registered students (new careers) for the indicated academic year, at the end of the regular duration of the Study Programme, highlighting the percentage of regular graduates, the number of students still enrolled (not aligned to the exam schedule and repeating students), students who have left the programme (including passages, transfers and withdrawals).
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for students enrolled in the indicated accademic year.

Situation of students 2010/2011 at the end of regular duration of the study programme



		New careers	Regular graduates		Passages transfers and withdrawals		Students still enrolled and not yet graduated	
			N.	%	N.	%	N.	%
Students 2009/2010	Study Programme	54	15	27,8%	7	13,0%	32	59,3%
	Average of similar Study Programmes	40,5	17	42,0%	4,3	10,7%	19,1	47,2%
Students 2010/2011	Study Programme	50	22	44,0%	2	4,0%	26	52,0%
	Average of similar Study Programmes	39,2	19,3	49,3%	3,7	9,3%	16,2	41,3%

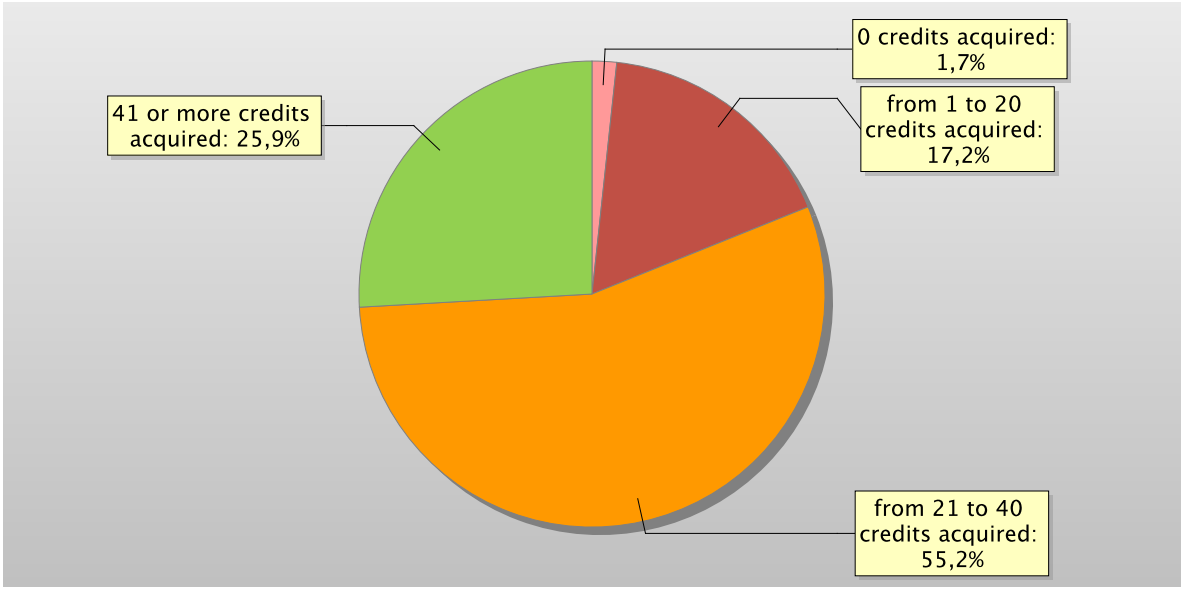
See data of previous academic years – Study Programme D.M. 509/99 Energy Engineering (code 0455) paragraph D.5.2.2.

D.2.3. ADDITIONAL DATA ON REGULARITY OF STUDIES

D.2.3.1. CREDITS OBTAINED BY STUDENTS IN THE 1ST YEAR

This offers an insight into how regularly students pass their exams.
The **graph** shows the distribution of the students according to the number of credits obtained at the end of the first year.
In addition, the **table** shows the number of students registered at the second year and average credits obtained during the first year.
The Study Programme data is compared with the average of similar Study Programmes (wich belong to the same group), for students registered in the indicated academic years.

Distribution of the students in 2011/2012 according to the number of credits obtained at the end of the first year*



		Students enrolled in the 2nd year	% students with *				Average credits per student
			0 credits acquired	from 1 to 20 credits acquired	from 21 to 40 credits acquired	41 or more credits acquired	
Students 2009/2010	Study Programme	47	2,1%	40,4%	42,6%	14,9%	25,1
	Average of similar Study Programmes	37,9	8,1%	22,8%	42,5%	26,7%	29
Students 2010/2011	Study Programme	49	4,1%	28,6%	32,7%	34,7%	30,2
	Average of similar Study Programmes	37,1	6,8%	17,0%	45,8%	30,4%	31,2
Students 2011/2012	Study Programme	58	1,7%	17,2%	55,2%	25,9%	32
	Average of similar Study Programmes	39	3,1%	16,3%	45,0%	35,6%	33,9

*Note: by convention, credits are considered to be obtained by students by 31st October of the year following the year of enrolment.

D.2.3.2. EXAMS PASSED AND AVERAGE GRADE

The **table** shows number of exams passed and average grade achieved for each course unit in the calendar year 2011. Marks for the exams passed are expressed out of thirty.

The data refers to the course unit code and therefore includes the various branches of the programme divided into channels or sub-groups, divided by letter.

It considers all subjects for which a grade is assigned, and therefore excludes all those to which a pass/fail score is allocated.

The data concerning previous programmes is given in a separate section.

Data of the Study Programme D.M. 270/04 Ingegneria energetica (code 0935)

	N. of exams passed	Average grade *
29207 APPLICAZIONI INDUSTRIALI DEI PLASMI M	48	27,2
29209 FISICA MODERNA M	22	29
29214 INGEGNERIA DEI PLASMI M	1	
30131 METALLURGIA MECCANICA M	1	
31401 FONDAMENTI E APPLICAZIONI DELL'ENERGIA NUCLEARE T	1	
31402 RADIOPROTEZIONE T	1	
33931 CHIMICA DEI PROCESSI DI COMBUSTIONE M	29	27,8
33945 PIASTRE E GUSCI M	7	30
33964 IMPATTO AMBIENTALE DEI SISTEMI ENERGETICI M	59	28,6
34567 CENTRALI ELETTRICHE M	27	27,9
34594 IMPIANTI NON CONVENZIONALI PER LA PRODUZIONE DI ENERGIA M	1	

	N. of exams passed	Average grade *
34603 METODI MATEMATICI E NUMERICI PER L'ENERGETICA M C.I.	42	27,8
34607 TRASMISSIONE DEL CALORE E TERMOFLUIDODINAMICA APPLICATA M C.I.	71	28,5
34609 TECNOLOGIE SOSTENIBILI PER LE RISORSE ENERGETICHE M	65	28,6
34610 IMPIEGO INDUSTRIALE DELL'ENERGIA E COGENERAZIONE M	4	
34611 NEUTRONICA E PLASMI M	55	28,3
34616 GESTIONE DEI SISTEMI ENERGETICI M	31	28,1
34617 TERMOIDRAULICA DEI FLUSSI BIFASE E IMPIANTI NON CONVENZIONALI PER LA PRODUZIONE DI ENERGIA M C.I.	43	27
34618 TERMOIDRAULICA DEI FLUSSI BIFASE M	1	
34622 TERMOTECNICA E IMPIANTI TERMOTECNICI M	11	27,4
34624 TECNOLOGIE ELETTRICHE INNOVATIVE M	15	28,8
34626 TRASPORTO DI PARTICELLE E DI RADIAZIONE E RADIOPROTEZIONE M C.I.	10	29,3
34628 RADIOPROTEZIONE M	2	
34640 LABORATORIO DI CALCOLO PARALLELO PER APPLICAZIONI ENERGETICHE E MECCANICHE AVANZATE M-B	1	
37402 SISTEMI ENERGETICI AVANZATI E COGENERAZIONE M	51	28,6
40060 CENTRALI ELETTRICHE E GENERAZIONE DISTRIBUITA M	20	29,3
65772 EVOLUZIONE STORICA E TECNOLOGICA DELL'ENERGIA NUCLEARE M	3	
65773 IMPIANTI MECCANICI M	4	
65774 INGEGNERIA DEI SISTEMI SUPERCONDUTTIVI M	3	
65775 SISTEMI PER L'UTILIZZAZIONE DELL'ENERGIA SOLARE E GEOTERMICA M	10	28,7
65776 TECNICHE DI MODELLISTICA E SIMULAZIONE PER L'ENERGETICA M	4	

* Note: no average grade is given if the number of exams passed is less than or equal to 5.

D.3. OPINIONS OF GRADUATES AND ATTENDING STUDENTS

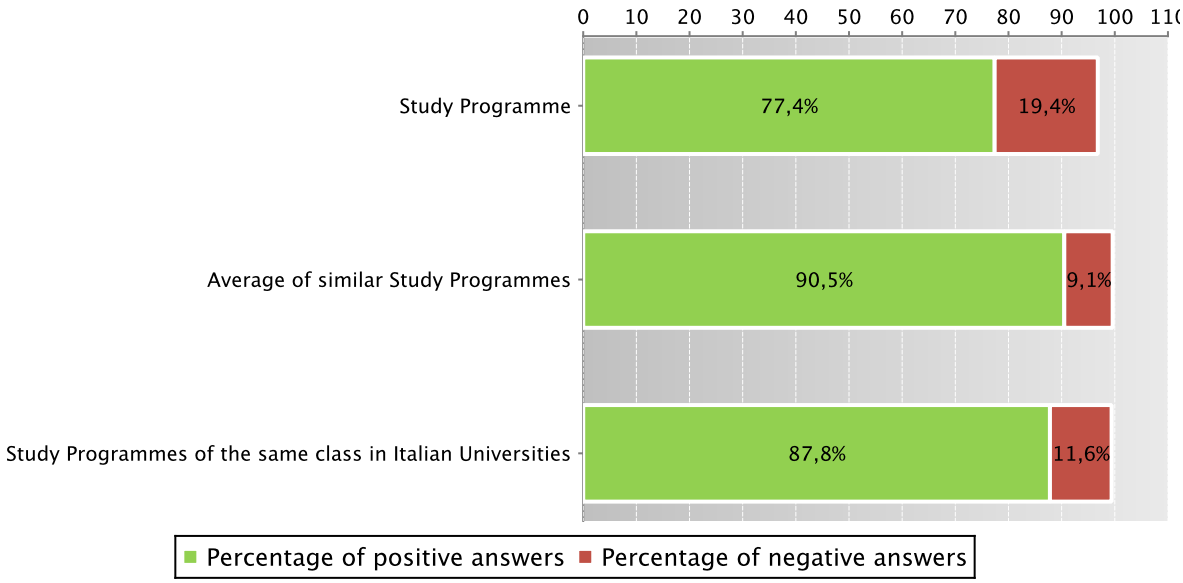
Opinions of graduates on the Study Programme.
Tables and graphs provide information on the number of graduates who expressed positive opinions on the Study Programme, focusing on opinions expressed by attending students on course units.

D.3.1. OPINION OF GRADUATES

The **graph** shows the percentage of graduates (AlmaLaurea survey) who responded positively to the question: "**Are you generally satisfied with the Study Programme".**
In addition, the **table** shows the percentage of students who answered "Yes, to the same programme at the university" to the question "Would you register again to the university?".
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), and the average of Study Programmes of the same class of other Italian universities for the graduates of the indicated years.

Graduates in 2012 who responded positively to the question: "Are you generally satisfied with this Study Programme?"

Data of the Study Programme D.M. 270/04 Ingegneria energetica (code 0935)



Data of the Study Programme D.M. 270/04 Ingegneria energetica (code 0935)

		N. graduates	Completed Questionnaires	% of positive answers to the question: "Are you generally satisfied with this Study Programme?"	% of answers "yes to the same Programme in the same University" to the question "Would you register again to the University"
2011	Study Programme	1	1		
	Average of similar Study Programmes	20	19,4	90,0%	78,4%
	Study Programmes of the same class in Italian Universities	69	68	83,8%	75,0%
2012	Study Programme	31	31	77,4%	64,5%
	Average of similar Study Programmes	22	21,5	90,5%	78,6%
	Study Programmes of the same class in Italian Universities	177	172	87,8%	75,6%

Symbols:

(*) The opinions of the Study Programmes with less than 5 graduates are not shown.

Further information on Graduates' Profile Report.

See data of previous academic years – Study Programme D.M. 509/99 Energy Engineering (code 0455) paragraph D.5.3.1.

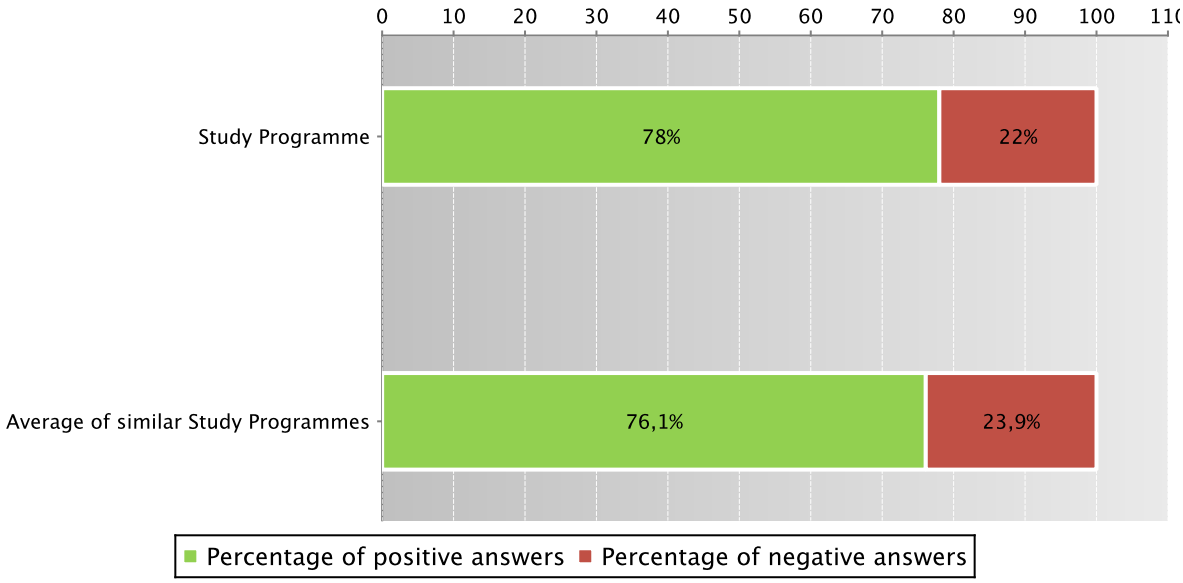
D.3.2 ADDITIONAL DATA ON OPINIONS OF STUDENTS

D.3.2.1. OPINION OF ATTENDING STUDENTS

The **graph** shows the percentage of attending students who responded positively to the question in the questionnaire: "Are you generally satisfied with this course unit?" in academic year 2011/2012.
The **table** also shows the number of completed questionnaires.
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for the indicated academic years.
The data concerning the students' opinion refers to the opinions of those attending lessons, whether they are enrolled in the current programme or a Study Programme running under pre-reform regulations (under D.M. 509).
For the University of Bologna the survey and subsequently analysis of the opinions of students attending the course is cared by *Aform* - Quality Assurance Department and *Arag* - Support Planning and Evaluation Department. The overall results and the methods of collection and analysis are described in the document published online on the Statistical Observatory of the University of Bologna (see the note in the glossary).

Students who responded positively to the question: "Are you generally satisfied with this course unit?" in academic year 2011/2012

Data of the Study Programme D.M. 270/04 Ingegneria energetica (code 0935) and of the Study Programme D.M. 509/99 Ingegneria energetica (code 0455)



Data of the Study Programme D.M. 270/04 Ingegneria energetica (code 0935) and of the Study Programme D.M. 509/99 Ingegneria energetica (code 0455)

		Number of completed questionnaires	% of positive answers concerning the general satisfaction with the course unit – Question 19
a.y. 2009/2010	Study Programme	423	67,0%
	Average of similar Study Programmes	386,1	77,1%
a.y. 2010/2011	Study Programme	441	73,9%
	Average of similar Study Programmes	372,6	77,9%
a.y. 2011/2012	Study Programme	563	78,0%
	Average of similar Study Programmes	422,1	76,1%

Symbols:

(*) When there is a small number of questionnaires, the percentage of positive opinions on overall satisfaction is not presented.

Further information on Rapporto Opinione degli studenti frequentanti sulle attività didattiche (the content is in Italian).

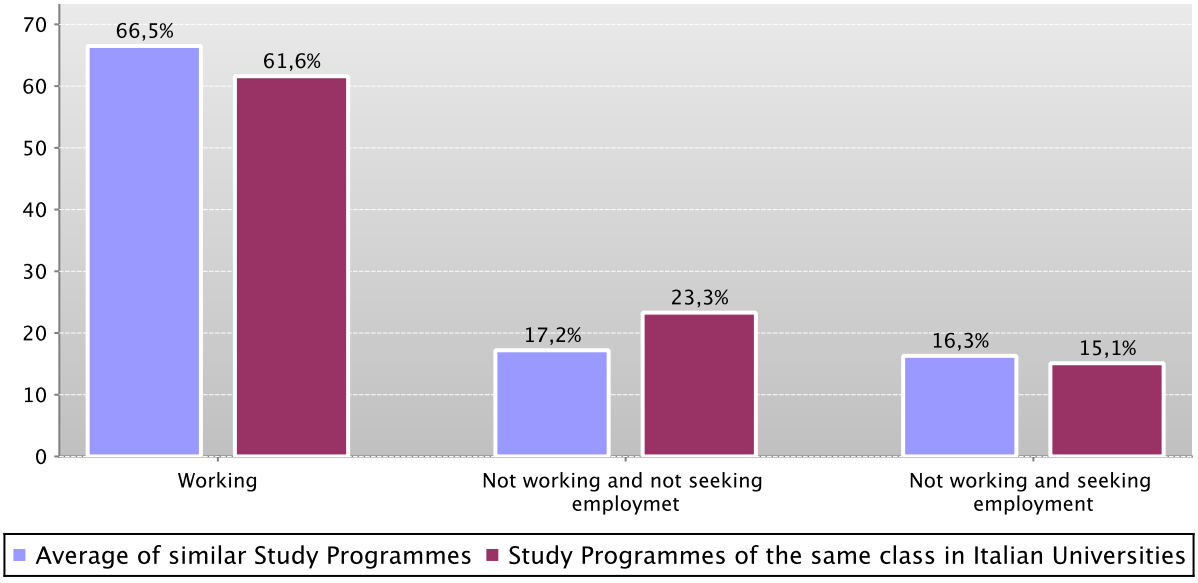
D.4. ENTRY INTO THE WORLD OF WORK

Employment situation of graduates of the Study Programme.
Tables and graphs provide information on the employment situation of graduates one year after graduating.

D.4.1. EMPLOYMENT SITUATION

The paragraph shows the employment situation of graduates one year after graduating.
The data is taken from the AlmaLaurea reports on the employment situation of graduates.
The **graph** shows who is working, who is not working and is not seeking employment, who is not working but is seeking employment.
In addition, the **table** shows the number of graduates interviewed, the number involved in internships and traineeships and the appropriateness of their degree to the job.
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group) and the average of Study Programmes of the same class of other Italian universities for the graduates of the indicated years.

Employment situation of graduates in 2011 one year after graduating



		N. graduates interviewed	Employment situation (1)			Not working, not seeking employment, but following a university programme/traineeship (2)	Degree's appropriateness for the job (referred to the graduates who just work) (3)	
			Working	Not working and not seeking employmet	Not working and seeking employment		Effective / very effective	Quite effective
Graduation Year 2011	Study Programme	1						
	Average of similar Study Programmes	17,8	66,5%	17,2%	16,3%	12,3%	58,1%	30,8%
	Study Programmes of the same class in Italian Universities	73	61,6%	23,3%	15,1%	17,8%	60,5%	27,9%

Symbols:

(*) The opinions of the Study Programmes with less than 5 graduates are not shown.

Notes on the AlmaLaurea report on the employment situation of graduates

(1) "Employment situation": the definition includes the number of employed graduates who declaring to carry out a paid work activity, provided that is not training activity (internship, traineeship, PhD degrees, specialization schools).

(2) "Number of those who do not work, who are not seeking employment but who are following a university programme/traineeship"**:** the definition includes those who are enrolled in traineeships, PhD degrees, specialisation schools, Italian "master universitari" (first and second level). The presentation of this data complies with article 2 of D.M. 544 of 31st October 2007, as later provided for in Management Decree no. 61 of 10th June 2008 (transparency requirements).

(3) The evaluation of the appropriateness of the degree is obtained by a combination of the requirement of the relative qualification for the job held and the level of usage of the skills learned at university.

Further information on Graduates' Employment report.

See data of previous academic years – Study Programme D.M. 509/99 Energy Engineering (code 0455) paragraph D.5.4.1.

D.5. INFORMATION ON PRE-REFORM PROGRAMMES (DM 509/99)

D.5.1. STUDENTS STARTING THEIR UNIVERSITY CAREERS

Characteristics of incoming students at the beginning of their study. Tables and graphs provide information on number of enrolled students (new careers), focusing on the characteristics of students.

D.5.1.1. ENROLMENTS

Data of enrolments of the last three academic years are shown in paragraph D.1.1.

D.5.1.2. ADDITIONAL DATA ON STUDENTS' STARTING THEIR UNIVERSITY CAREERS

D.5.1.2.1. CANDIDATES REGISTERED FOR THE ENTRANCE EXAM

Data of candidates registered for the entrance exam are shown in paragraph D.1.2.1.

D.5.1.2.2. INCOMING STUDENTS

Data of incoming students of the last three academic years are shown in paragraph D.1.2.2.

D.5.2. REGULARITY OF STUDIES

Insight into the regularity with which the students pass their exams.
Graphs and tables provide information on the number of students who leave the programme after the first year and the number of regular graduates, focusing on the number of credits obtained at the end of the first year, number of exams passed and the average grade achieved for each course unit.

D.5.2.1. STUDENTS LEAVING THE PROGRAMME BETWEEN YEARS 1 AND 2

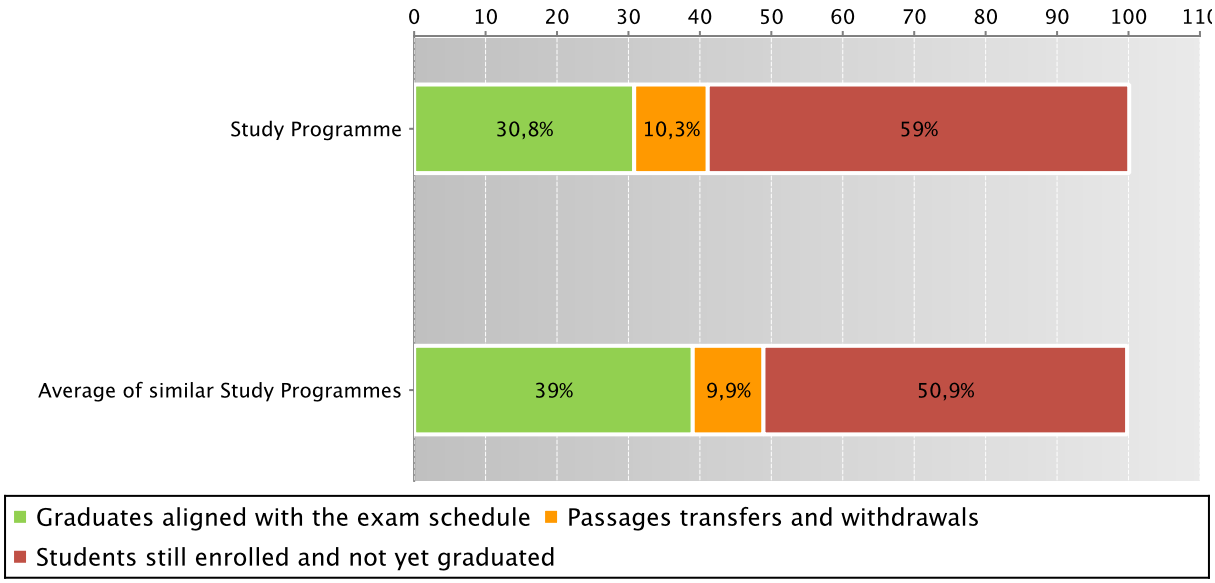
Data of students leaving the Study Programme of the last three academic years are shown in paragraph D.2.1.

D.5.2.2. REGULAR GRADUATES

Here you will find information on regular graduates, on how many students, at the end of the regular programme duration, left the programme and how many are still enrolled but not aligned to the exam schedule.
The **graph** and the **table** show the situation concerning the students enrolled at the first year (new careers) for the indicated academic year, at the end of the regular duration of the Study Programme, highlighting the percentage of regular graduates, the number of students still enrolled (not aligned to the exam schedule and repeating students), students who have left the programme (including passages, transfers and withdrawals).
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for students registered in the indicated academic years.

Situation of students 2008/2009 at the end of regular duration of the study programme

Data of the Study Programme D.M. 509/99 Energy Engineering (code 0455)



Data of the Study Programme D.M. 509/99 Energy Engineering (code 0455)

		New careers	Regular graduates		Passages transfers and withdrawals		Students still enrolled and not yet graduated	
			N.	%	N.	%	N.	%
Students 2008/2009	Study Programme	39	12	30,8%	4	10,3%	23	59,0%
	Average of similar Study Programmes	42,6	16,6	39,0%	4,2	9,9%	21,7	50,9%

Go back to D.2.2. Regular graduates

D.5.2.3. ADDITIONAL DATA ON REGULARITY OF STUDIES

D.5.2.3.1. CREDITS OBTAINED BY STUDENTS IN THE 1ST YEAR

Data of credits obtained by students in the 1st year of the last three academic years are shown in paragraph D.2.3.1.

D.5.2.3.2. EXAMS PASSED AND AVERAGE GRADE

Data of exams passed and average grade are shown in paragraph D.2.3.2.

D.5.3. OPINIONS OF ATTENDING STUDENTS AND GRADUATES

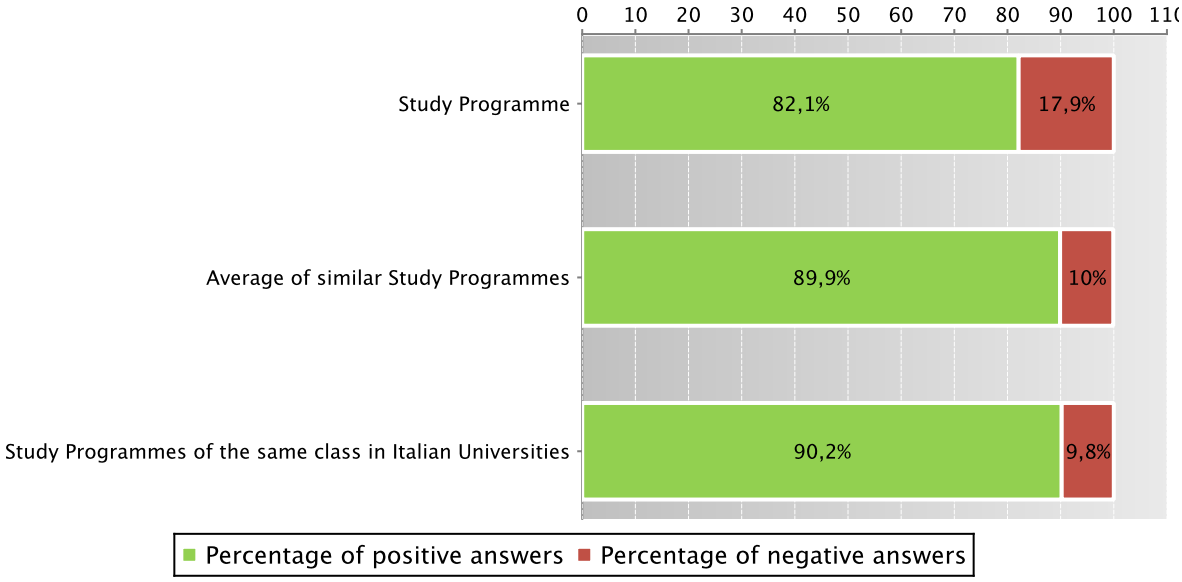
Opinions of graduates on the Study Programme.
Tables and graphs provide information on the number of graduates who expressed positive opinions on the Study Programme, focusing on opinions expressed by attending students on course units.

D.5.3.1. OPINION OF GRADUATES

The **graph** shows the percentage of graduates (AlmaLaurea survey) who responded positively to the question: "**Are you generally satisfied with the Study Programme**".
In addition, the **table** shows the percentage of students who answered "Yes, to the same programme at the university" to the question "Would you register again to the university?".
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group), for the indicated years.

Graduates in 2010 who responded positively to the question: "Are you generally satisfied with this Study Programme?"

Data of the Study Programme D.M. 509/99 Ingegneria energetica (code 0455)



Data of the Study Programme D.M. 509/99 Ingegneria energetica (code 0455)

		N. graduates	Completed Questionnaires	% of positive answers to the question: "Are you generally satisfied with this Study Programme?"	% of answers "yes to the same Programme in the same University" to the question "Would you register again to the University"
2010	Study Programme	29	28	82,1%	67,9%
	Average of similar Study Programmes	25,5	24,8	89,9%	78,6%
	Study Programmes of the same class in Italian Universities	172	164	90,2%	79,3%

Symbols:
(*) The opinions of the Study Programmes with less than 5 graduates are not shown.
Further information on Graduates' Profile Report.
Go back to D.3.1. Opinion of graduates

D.5.3.2 ADDITIONAL DATA ON OPINIONS OF STUDENTS

D.5.3.2.1. OPINION OF ATTENDING STUDENTS

Data of opinion of attending students of the last three academic years are shown in paragraph D.3.2.1.

D.5.4. ENTRY INTO THE WORLD OF WORK

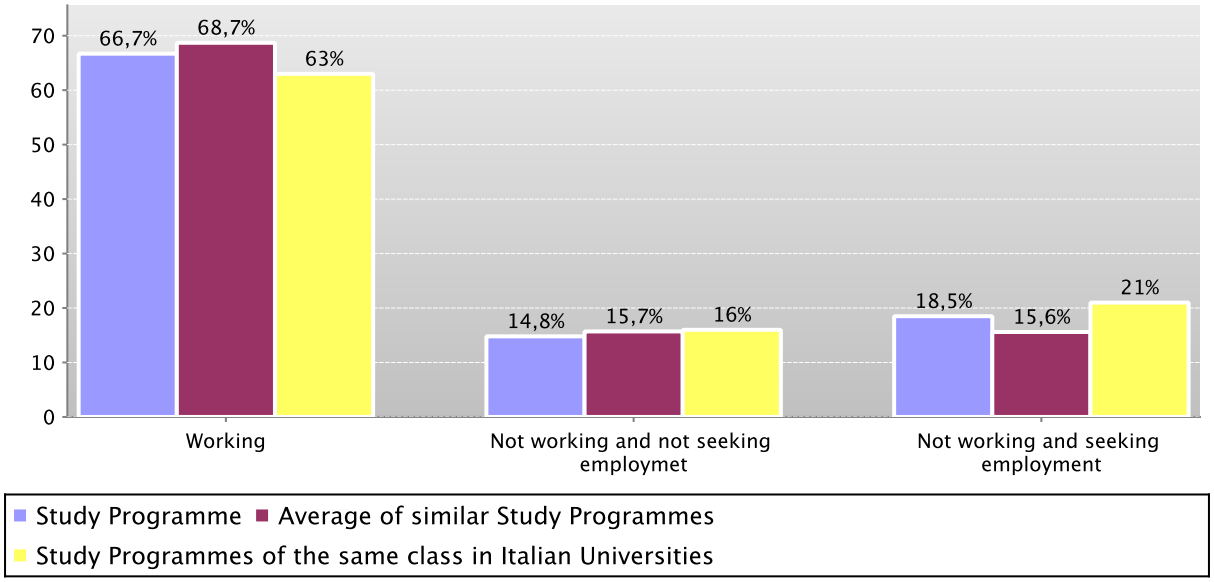
Employment situation of graduates of the Study Programme.
Tables and graphs provide information on the employment situation of graduates one year after graduating.

D.5.4.1. EMPLOYMENT SITUATION

The paragraph shows the employment situation of graduates one year after graduating.
The data is taken from the AlmaLaurea reports on the employment situation of graduates.
The **graph** shows who is working, who is not working and is not seeking employment, who is not working but is seeking employment.
In addition, the **table** shows the number of graduates interviewed, the number involved in internships and traineeships and the appropriateness of their degree to the job.
The Study Programme data is compared with the average of similar Study Programmes (which belong to the same group) and the average of Study Programmes of the same class of other Italian universities for the graduates of the indicated years.

Employment situation of graduates in 2010 one year after graduating

Data of the Study Programme D.M. 509/99 Energy Engineering (code 0455)



Data of the Study Programme D.M. 509/99 Energy Engineering (code 0455)

		N. graduates interviewed	Employment situation (1)			Not working, not seeking employment, but following a university programme/traineeship (2)	Degree's appropriateness for the job (referred to the graduates who just work) (3)	
			Working	Not working and not seeking employmet	Not working and seeking employment		Effective / very effective	Quite effective
Graduation Year 2009	Study Programme	23	43,5%	34,8%	21,7%	21,7%	60,0%	40,0%
	Average of similar Study Programmes	32,1	63,8%	18,3%	17,9%	11,8%	55,3%	34,7%
	Study Programmes of the same class in Italian Universities	114	59,6%	21,1%	19,3%	12,3%	64,7%	29,4%
Graduation Year 2010	Study Programme	27	66,7%	14,8%	18,5%	11,1%	38,9%	44,4%
	Average of similar Study Programmes	23,5	68,7%	15,7%	15,6%	9,9%	57,4%	32,5%
	Study Programmes of the same class in Italian Universities	162	63,0%	16,0%	21,0%	11,7%	52,5%	37,6%

Symbols:

(*) The opinions of the Study Programmes with less than 5 graduates are not shown.

Notes on the AlmaLaurea report on the employment situation of graduates

(1) "Employment situation": the definition includes the number of employed graduates who declaring to carry out a paid work activity, provided that is not training activity (internship, traineeship, PhD degrees, specialization schools).

(2) "Number of those who do not work, who are not seeking employment but who are following a university programme/traineeship**":** the definition includes those who are enrolled in traineeships, PhD degrees, specialisation schools, Italian "master universitari" (first and second level). The presentation of this data complies with article 2 of D.M. 544 of 31st October 2007, as later provided for in Management Decree no. 61 of 10th June 2008 (transparency requirements).

(3) The evaluation of the appropriateness of the degree is obtained by a combination of the requirement of the relative qualification for the job held and the level of usage of the skills learned at university.

Further information on Graduates' Employment report.

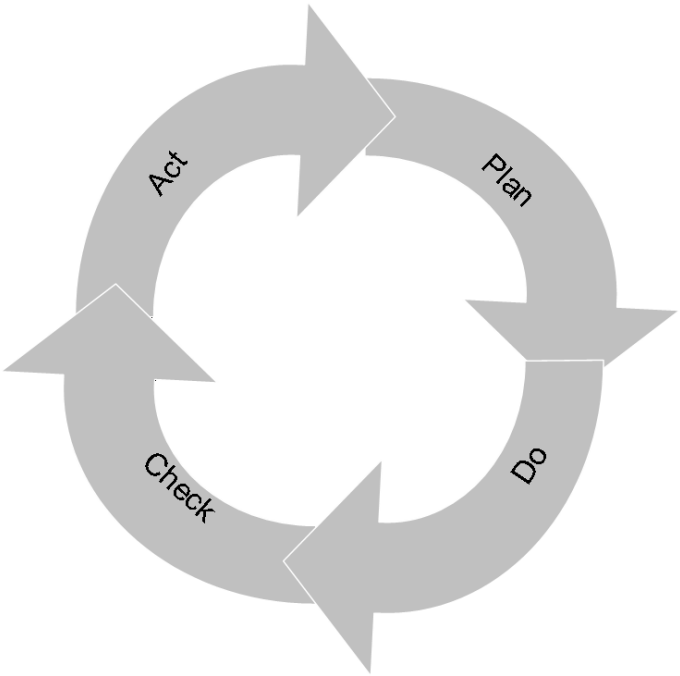
Go back to D.4.1. Employment situation

E. FIND OUT MORE: THE QUALITY OF YOUR STUDY PROGRAMME

The University of Bologna has identified its objectives as the *personal, cultural and professional growth of students and the improvement of the quality of learning, also in relation to the needs of society* (Strategic Plan 2010-2013).
Students, employers and society as a whole, have the right to effective learning for individual and intellectual growth, to develop critical sense and to prepare for the world of work.
In the Statute and the Strategic Plan 2010-2013 the University of Bologna acknowledges its responsibility in guaranteeing the quality of its study programmes, and for this purpose adopts an "internal quality assurance system".

The Internal Quality Assurance system
The internal quality assurance system is a set of processes and responsibilities adopted to guarantee the quality of Study Programmes at the University of Bologna.
The guarantee of the quality of a Study Programme is the correspondence of the results achieved with the set objectives, in the following phases:

- Plan: defining the objectives
- Do: implementing the planned actions
- Check: checking that the objectives have been achieved
- Act: planning improvement action



This path responds to the expectations of students, guides teaching behaviour and provides indicators for the assessment of results. Self-assessment is based on the analysis of significant data (for example, the number of students graduating in line with the exam schedule, students' opinions and the employment rates of graduates) and highlights strengths and weaknesses in order to reflect on the achieved results, critically consider one's own working methods and take steps for the continual improvement of the Programme.
This path involves all educational stakeholders, including students, in order to make use of the contributions of everyone with first-hand knowledge of the Study Programme. Improvement is therefore a day to day development, concerning all aspects of teaching: from the lesson timetable to the publication of on-line programmes, from classroom management to exam methods, and the actual design of the Programme.

This is what happens in each phase:

- **Planning**: the Study Programme is the result of a proposal from the teaching structures and approved by the Academic Bodies.
- **Management**: Schools, Departments and Study Programmes manage the activities required to ensure teaching. The activities are organised as follows**:**

What we do	Who does what				
	Professors	**Study Programme**	**Schools**	**Departments**	**General Administration**
Teaching calendar, lessons programme and exam schedules			x		
Management of financial resources			x	x	
Classroom teaching	x				
Management of classrooms and laboratories			x	x	
Libraries and study rooms			x	x	
Approval of individual study plans		x			
Communication and information		x	x		Academic Affairs Division
Guidance service		x	x		Academic Affairs Division
Internships		x	x		Academic Affairs Division
Administrative services: Student Administration Office					Academic Affairs Division
Administration services: Degree programme office			x		Academic Affairs Division
Study grants and loans ad honorem					Academic Affairs Division
Student mobility: university subsidies and programmes					International Relations Division
Mobility: study grants for dissertations abroad			x		
Mobility: authorisations and recognitions		x			
Other students support services		x	x		x

- **Internal assessment:** every Study Programme periodically assesses its own results, evaluating, for example, the number of enrolled students, the number of withdrawing students, student opinions etc.; in this way, the strengths and weaknesses, as well as any implemented improvement actions, are highlighted. This phase is organised as follows:

What we do	Who does what
Definition, gathering and publication of evaluation data According to the general guidelines of the University and national and international standards, are defined the tools through which should be evaluated the results (indicators). The survey data to be evaluate are published every year on the Report of the Study Program.	Academic Bodies
Self-Assessment The Schools and Study Programmes assess the effectiveness of the previously adopted solutions, analyse the progress of their learning activities and draw up proposals for improvement.	Schools and Study Programmes
Internal audit The results of the self-assessment process are reviewed in the following phases: • Analysis: the University Quality Manager analyses the review documents, considering the ability to identify problems, propose solutions and the overall development of the internal quality assurance system. • Review: The observations on the results obtained and the good practices adopted are examined together with the persons in charge of the Schools and Study Programmes in meetings organised by scientific-disciplinary field. The persons in charge receive the observations and inputs on the areas for development and the actions to be adopted in future to improve results. • Sharing: the conclusions of the review activities are submitted to the Academic Bodies and the University Evaluation Board.	Quality Manager Vice Rector for Teaching and Education Academic Bodies

- **Improvement**: on the basis of the results of the internal audit, the Schools and Study Programmes plan improvement activities, to ensure that the Study Programmes increasingly respond to the needs of society. The cycle then starts over again, with the definition of actions to be implemented, the results of which are in turn verified, in a continuous path that guarantees the quality of education.

F. GLOSSARY TERMS

Additional Learning Requirements

Students enrolling in the first year of a first cycle or single cycle degree and who, following the results of the entrance exams established for each study programme, do not possess the knowledge required for access to the programme, are assigned additional learning requirements (OFA).
The OFA are fulfilled by passing an assessment test defined by the programme.
The non-fulfilment of the requirements by the date set by the Academic Bodies and published on the University Portal will lead to the re-enrolment in the first year of the programme.

AlmaLaurea

AlmaLaurea is an innovative in-line database service of graduates' curriculum vitae (1,620,000 CVs, from 53 Italian universities as of 05/07/2012), which offers a link between graduates, universities and businesses.
Created in 1994 on the initiative of the Statistical Observatory of the University of Bologna, managed by a consortium of Italian universities with the support of the Ministry of Education, University and Research, the purpose AlmaLaurea is to act as a point of contact between businesses and graduates, a reference within universities for anyone (students, businesses, etc...) working in the field of university studies, employment and the condition of young people at different levels.

Average of similar study programmes (belonging to the same group)

Average of the Study Programmes (which belong to the subject group)
Calculated average which refers to all study programmes of the same cycle which belong to the subject group.
There are four groups, composed as follows:

- BIOMEDICAL group: Study Programmes of the Schools of Pharmacy, Biotechnology and Sport Science; Medicine; Agriculture and Veterinary Medicine
- SCIENTIFIC-TECHNOLOGICAL group: Study Programmes of the Schools of Engineering and Architecture; Sciences
- SOCIAL SCIENCES group: Study Programmes of the Schools of Economics, Management, and Statistics; Law, Political Sciences
- HUMANITIES group: Study Programmes of the Schools of Arts, Humanities, and Cultural Heritage; Foreign Languages and Literatures, Interpreting and Translation; Psychology and Education

CFU University Learning Credits

University Learning Credits (CFU) were introduced under Italian Ministerial Decree no. 509/99 to comply with European legislation, and are a measurement of the volume of learning, including individual study, required of students; generally 1 CFU corresponds to 25 hours of a student's "overall learning effort".

Class

Degree classes group together study programmes of the same level and with the same key learning outcomes and available learning activities for a given number of credits and in sectors which are identified as indispensable. The features of the classes are set nationally, by Ministerial Decree, and are therefore common to all universities.

Cohort

Cohort refers to a group of students enrolled in the same academic year.

Enrolment status

In terms of enrolment, students may be:

- **Regularly enrolled**: students enrolled for as many or fewer years than the legal duration of the study programme, who do not fall into any of the following categories;
- **Not aligned with the exam schedule**: students who, without having graduated, have enrolled in all the years of the study programme and which, for programmes with compulsory attendance, have obtained all attendance certificates;
- **Repeating**: students re-enrolling in the same year of a programme again. Starting from academic year 2009-2010, students who have not fulfilled the assigned additional learning requirements within the deadline have to enrol in the 1st year as repeating students.

Entrance exam

Enrolment in a study programme may be free access or restricted access.

For all programmes with restricted access, candidates are required to sit an entrance exam and there are a limited number of places available. The entrance exam is a test which is used to draw up a graded list of candidates; students may enrol in the programme according to their place in the list. The methods of managing the call for applications and the list of candidates, including the methods for filling any unclaimed places, may vary from year to year. The test may be specific to a Degree Programme or may be part of a single exam covering several programmes from the same university or from other universities (during the registration the students should indicate their first choice).
The following definitions apply:
Available places = the number of places laid down in the call for applications to the Study Programme, or determined by subsequent legal provisions; these exclude any additional places reserved according to special provisions of the programme (e.g. for international study programmes, they do not include places for foreign students selected from other universities; for all programmes with restricted access regulated nationally, these do not include the places reserved for transferring students).
Number of candidates for the exam = number of students registered for the exam indicating the study programme as their first choice;
Number of participants in the exam = number of students participating in the exam indicating the study programme as their first choice;
Number of participants in the exam for every available place = number of students participating in the exam who indicated the study programme as their first choice as a ratio of the number of places available on the programme.

First year enrolments

This includes all students enrolled in the first year, including those joining the study programme in its first year through transferrals, as well as those enrolled in the first year but not for the first time (e.g. repeating students).

New Careers

Students who start a new university career (excluding transfers) from year one in a second cycle programme.

Passages and transfers

Passage: when a student applies to move to a different study programme from the one enrolled in the previous year, within the same university.
Transfer: when a student transfers from a study programme in one university to any programme in another university.

Registered students

Students who begin a career in the Italian University System for the first time and who enrol in the first year (i.e. for whom no previous university careers are recorded) of a First Cycle (L509, L) or Single Cycle programme (LSCU, LMCU)

Statistical Observatory of the University of Bologna

The Statistical Observatory was founded in 1997 in order to "provide the university governing bodies with a reliable and timely documentary and monitoring database aiming to promote decision-making processes and planning, particularly of learning activities and other services targeting the student population" (art.1 of the Founding and Operational Regulation). Following the disabling of the Statistical Observatory, as resolved by the Board of Governors on 14 December 2010, from the second semester of academic year 2010-11 the survey and subsequently analysis of the attending students opinion is cared for the University of Bologna by Academic Affairs Division - Quality Assurance Department and Control and Finance Division - Support Planning and Evaluation Department. The overall results and the methods of collection and analysis are described in the document published online on the Statistical Observatory of the University of Bologna.

University DataWarehouse

In information service for the managers of the University of Bologna organisational departments which gathers, integrates and reorganises data from various sources and makes it available for analysis and evaluation for the purposes of planning and decision-making.

Withdrawal

Suspension of studies by students who do not register in the next academic year, or who drop out from the degree programme.