REPORT 2013

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

School of Engineering and Architecture – Cesena Campus

Laurea Magistrale (Second cycle degree/Two year Master - 120 ECTS) in Computer Science and Engineering a.y. 2013/2014

Programme Director Prof. NATALI ANTONIO

Study Programme Report
Computer Science and Engineering
Programme ex D.M. 270/04 - Code 8614 - Class LM-18 LM-32
School of Engineering and Architecture – Cesena Campus
Programme Director Prof. NATALI ANTONIO

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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 professional learning outcomes specified in the university degree class regulations are achieved by a varied course curriculum which aims to produce graduates with both a solid, in-depth theoretical, methodological, and technological background, as well as special operating skills deriving from targeted project activities which are an integral part of the degree programme. The set of knowledge and skills acquired by graduates allow them to take part in all activities concerning the development of highly complex systems, processes, and services, in the specific field of the design and development of computer systems, and in any other context in which computer models and technologies play an important role.
The 2nd cycle degree programme offers qualified, specific training in the field of computing, with a systematic approach to engineering-based computer problems. These general outcomes broaden the mathematical and computing bases and knowledge of the three-year degree programme, extending methodological skills in order to allow students, and then graduates, to integrate their knowledge, form opinions on the basis of limited or incomplete information and to tackle complexity in systems design. The specific learning outcomes depend on the chosen study plan. The underlying Computing path focuses on information systems and web technologies, artificial vision and image processing. The underlying Computer Engineering path concentrates on complex computer systems and particularly on the principles, techniques, and methods for their design.
A specific learning outcome for both programmes is training and preparation for continuing learning to PhD level at either the university or a research body.
Computer Sciences and Engineering graduates will possess:
- a broad base of knowledge and skills in different computing sectors for use in the design, development, and management of computer systems and networks, whatever their specific application;
- specialist knowledge and skills in specific sectors of computing and computer engineering according to the chosen study plan;
- a command of mathematical tools, particularly those required for formal modelling, analysis, evaluation, optimisation, and implementation of systems;
- the ability to gather experimental data and interpret its meaning in order to assess the effectiveness and efficiency of complex computer systems;
- the ability to work in groups, with set levels of autonomy, organising, and directing the work of others;
- the ability to process and/or apply original ideas, also in research contexts, and in any case to solve problems in either new or unfamiliar areas within broader (or interdisciplinary) contexts;
- the ability to integrate knowledge, manage complexity, form opinions also based on incomplete data
- the ability to use effectively, orally and in writing, at least one European Union language other than Italian, in their specific field of competence, and to exchange general information;
- the ability to carry out bibliographical research also using databases and computer networks.

To provide graduates with the above competencies, the 2nd cycle degree programme in Computer Sciences and Engineering:
- includes activities aiming to develop advanced knowledge of logic and mathematics, as well as the main areas of computing;
- includes design and laboratory activities to develop knowledge of programming methods and the construction of computer systems.

Computer Sciences and Engineering graduates complete their studies with knowledge of the English language to level B2. Study may include both the acquisition of the four linguistic skills (reading, writing, listening and dialogue) and compulsory attendance of lessons, in line with the criteria specified by the study programme coherently with the instructions of the Academic Bodies.

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.

LEARNING OUTCOMES
knowledge and understanding
2nd cycle graduates:

- will have an in-depth knowledge of the principles, methodologies and tools for the architectural and logical design of digital information processing systems;
- will have an in-depth knowledge of the functions and architecture of modern processors, as well as the design aspects linked to their use for the purposes of developing general-purpose computer platforms or embedded systems which satisfy specific application requirements;
- possess a strong command of the mathematical tools required for formal modelling, analysis, evaluation, optimisation, and implementation of computer systems;
- will have an in-depth knowledge of the principles, methods and solutions lying behind modern operating systems, as well as the methodologies and tools for the design and implementation of concurrent and distributed applications;
- will have an in-depth knowledge of the problems, technologies and reference standards relating to the design of services and applications in distributed and heterogeneous environments;
- will know the principles, methods and tools for the design, use and management of countermeasures and services to fight intentional attacks against the integrity, confidentiality, and availability of information;
- will know the principles, methodologies and tools to solve problems of artificial intelligence, with particular reference to knowledge-based systems and logic-based methodologies;
- will know modern software engineering methods and tools for the analysis, modelling, design, and testing of highly complex software applications;
- will know the principles behind the modern programming languages, the models for their formal description, and the relative interpretation techniques;
- will know the principles, methodologies and tools for the implementation and use of modern information systems, also from a multimedia information management point of view;
- will know the principles, methods, main standard and tools for the implementation and use of modern web systems;
- will know the principles, methodologies and tools for the implementation and use of modern information systems, also from a multimedia information management point of view;
- will know the theories and advanced algorithmic methodologies to solve decision-making problems in social and industrial situations, particularly concerning the management and optimal coordination of activities and the available resources;
- will possess knowledge of algorithms, tools and systems for image processing and analysis and the implementation of artificial vision systems;
- will possess the methodological and design knowledge required to develop processing systems and strategies for the real time monitoring of complex dynamic systems;
- will be able to understand and critically analyse the costs and benefits deriving from the use and integration of innovative technologies, components, equipment and systems in complex and diversified contexts.

Graduates acquire the aforementioned knowledge and competencies through participation in lectures and exercised, guided self-study and personal study required in the individual learning activities in the core subject areas, INF/01 and ING-INF/05. The teaching methods used include participation in seminars and exercises in the classroom and in the laboratory, individual and group projects, guided self-study and autonomous study. The described learning outcomes will be assessed 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 the principles, methods, and support tools to design digital systems for the development of integrated solutions in different contexts;
- will be able to apply their knowledge of advanced processors in order to develop both general-purpose computer platforms and embedded systems which satisfy even highly complex and specific application requirements;
- will know how to apply the principles, methods and instruments of concurrent programming to design and implement concurrent and distributed applications for the solution of complex problems in complex and heterogeneous application environments;
- will be able to apply their knowledge of the problems, technologies, and standards of network protocols and infrastructure to design services and applications in large-scale heterogeneous distributed systems;
- will be able to use the knowledge of information security technologies to design and manage services to fight intentional attacks against the integrity, confidentiality and availability of information;
- will be able to apply their knowledge of artificial intelligence to design and implement knowledge-based systems to solve complex problems;
- will understand the organisational and design aspects of computer systems, and apply this knowledge to implement and manage databases in different applications;
- will understand the organisational and design aspects of web systems, and be able to apply this knowledge to implement and manage web-based applications;
- will be able to apply their knowledge of software engineering to analyse, model, design, and test complex software applications;

- will be able to apply their knowledge of programming languages to design and implement, in conformity with different computer paradigms, interpreters, compilers and relative executional supports;
- will be able to apply their knowledge of digital image processing and artificial vision to design and implement feature extraction and object recognition systems in different scenarios;
- will know how to apply their knowledge of real-time processing systems to design algorithms and control units for complex dynamic systems;
- will possess managerial skills, organising the work of others and supervising subordinate staff;
- will be able to apply economic and management skills for the optimal organisation of innovative business processes, relative to both the strategic analysis of technological choices and the integration of research and development activities with other company functions.
- will be able to adapt to new situations;
- will be able to skilfully plan and manage their own time.

The above knowledge and understanding are achieved in core activities through the critical study of texts proposed for self-study, stimulated by classroom activities, the research of case studies and applications presented by the professors, practical exercises, individual and/or group project work, and through the preparation of the final examination. The dissertation project for the 2nd cycle degree programme, in which the level of autonomy and the ability to propose original and innovative solutions constitute the main evaluation criteria, is the key moment for the verification of this learning process. Finally, further applied learning skills are accomplished through the various opportunities made available through visits to businesses, the development of projects in cooperation with PhD researchers, the work placement, and international experiences offered by the student mobility and exchange programmes.

making judgements

2nd cycle graduates:

- will be able to distinguish, judge, and evaluate medium and long-term innovative computer technologies, and to critically assess the limits of current computer methodologies and technologies, identifying the directions to follow in order to overcome them;
- will possess general analysis and description skills;
- will possess generic logical skills not directly related to the computing context (reasoning skills).
- will be able to critically investigate the structural quality and performance of complex computer applications using analysis techniques and experimental tests, and verify their compliance with design specifications and level of conformity with legal or practical standards, identifying any problems, and proposing corrective strategies for their resolution;
- will be able to focus the essential elements of technical reports presented or produced by interlocutors, and to extrapolate their qualifying and innovative features;
- will be able to understand articles published in technical/scientific literature and proceed with the formulation of an autonomous opinion on their importance and implications;
- will be able to retrieve and consult the main bibliographical sources, new standards emerging nationally and internationally, regulations concerning industrial product and system certification, also on the Internet.

The aforementioned judgement skills are achieved through the learning activities organised in the core subject areas INF/01 and ING-INGF/05, and further activities including internships and specific workshops and the preparation for the final examination. They are assessed during the tests at the end of each course unit, in particular those which include computing project work.

communication skills

2nd cycle graduates:

- will be able to present materials and scientific reasoning orally and in writing to an informed audience;
- will be able to communicate problems, ideas, solutions, technical information effectively and efficiently in Italian or English (B2 level), in writing and orally, to both specialist and non specialist interlocutors;
- will be able to produce technical reports on the activities carried out and present summaries of the key results in group discussions;
- will be able to work proficiently in and coordinate teams to manage, design, test, and verify the performance of computer systems, processes and applications, motivating their decisions and choices;
- will be able to write technical and scientific articles.

The aforementioned communication skills are achieved through the participation in core and supplementary learning activities a well as further activities including work placement and laboratories and the preparation for the final examination. The teaching methods used include participation in exercises in the classroom and in the laboratory, individual and group projects and guided self-study. The described learning outcomes shall be assessed mainly through written and oral exams and the discussion of project work, also using multimedia tools and computer presentations. English language knowledge will also be tested as part of the assessment of the acquisition of communication skills.

learning skills

2nd cycle graduates:

- will be able to work autonomously;
- will be able to keep abreast of methods, techniques, and instruments used in the analysis of requirements, modelling and design, testing and commissioning, optimisation the performance of information systems and applications;

- will be able to promote the evolution of ICT technologies, and to identify new information and training needs;
- will be able to continue to advanced studies with a high degree of autonomy in all sectors of Computing and Information Engineering;
- will have achieved a standard of knowledge and competence that offers access to PhD programmes.

Learning skills are acquired throughout the study period, particularly concerning self-study, the production of individual assignments and the activities carried out in preparation for the final examination.
Learning skills are assessed continuously during the learning activities also including tutoring activities for projects and the assessment of self-learning skills developed during the activities in preparation of the final examination.

A.4. CAREER OPPORTUNITIES

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

The Degree Programme offers a curriculum that trains for the following professions:
Computer systems software designer:
this role involves the participation in and/or coordination of all activities involved in the design of complex software systems.
In particular:
- investigates and develops methods for problem solving, promotes the use of advanced technologies for the modelling and development of applications;
- uses the main programming environments and structured programming ruls and objects to develop complex applications;
- develops new operative techniques and support tools for design, managing the impact of their concrete application;
- designs and participates in the implementation of computer systems (also through process re-engineering) according to set functional specifications, system constraints and design guidelines;
- designs and participates in the implementation of knowledge-based systems to solve complex problems using artificial intelligence techniques;
- designs and participates in the implementation of concurrent and distributed applications to solve complex problems in both operating systems and other applications;
- designs and participates in the implementation of even highly complex network services and applications in distributed and heterogeneous scenarios;
- designs and implements logistics and supply chain support systems;
- organises and plans the activities for the implementation, testing, verification of the performance of software systems, managing the review and development of prototype solutions;
- documents, controls and certifies software production processes.

Research and innovative development technician:
this role involves the implementation of theoretical and experimental investigations in various computing sectors in industries, research centres and training institutes. In particular:
- carries out research on technologies, products, regulations and patents;
- promotes and participates in national and international research projects;
- promotes technological innovation processes in companies, based on the results of experiments and research activities;
- defines, organises and carries out laboratory experiments and gathers and critically interprets the obtained data.

Computer infrastructure designer:
participates and/or coordinates all activities involved in the design and implementation of both complex general purpose platforms and embedded systems satisfying specific application requirements. In particular:
- designs complex architectures using advanced processors and components;
- identifies efficient solutions and executes the logical design of functional units for the satisfaction of special application requirements, managing the impact of their integration in complex architectures.

Industrial machinery, plant and process automation technician: participates and/or coordinates all activities involved in the design of automation hardware systems. In particular:
- defines the architecture, functional units and network infrastructure required for the implementation of complex distributed control systems;
- designs and implements software components for general use;
- designs and participates in the implementation of hardware systems for real-time data acquisition and processing;
- designs and participates in the implementation of supervision systems for the automatic management of diagnostic information and production data.

Large-scale computer systems construction technician:
- defines system design and development processes, coordinating and managing work units, activities and products;
- determines the fundamental principles for managing complexity and the techniques for tackling large-scale problems;
- selects the methods, technologies and standards for development, defining spheres of action and assuring effective integration;

- designs the architecture, functional components and communication and coordination components of the system, as well as their topological distribution;
- participates extensively in the development and control of large system properties, applying advanced techniques to manage complexity;
- identifies innovative solutions to problems of high complexity, also based on the most recent scientific literature.

Computer systems and web applications designer:
manages both the technologies used to implement complex web applications and those used to manage large quantities of data. These competences, associated with the knowledge of design methodologies and requirements, allow his to work as analyst or designer for the implementation of complex computer systems development projects and web applications involving high levels of system-user interaction (web 2.0). May hold managerial positions in data centres in large corporations, in charge of the supervision of computer projects, computer development plans and the technological choices made by the company.
Systems designer for image processing and artificial vision:
has gained the skills required to develop advanced techniques and algorithms for image processing and object recognition. Can participate (as designer) in the development of new (automatic or semi-assisted) tools or specific techniques for solving real artificial vision problems. Can hold managerial roles in the medical, biomedical, astronomic, environmental sectors and work in industrial concerns that develop automatic control systems and quality inspection systems, recognition-based security systems, video-surveillance, automatic vehicle driving , satellite image analysis, robotics, etc.
Career opportunities for graduates of this degree programme lie in all areas of the modern technological society, and in particular in outsourced software development and design businesses, manufacturing and tertiary sectors, industrial automation companies, process industries, the civil service, research and training institutes, or as freelance professionals,. Computer engineers put their skills to use in the processes of innovation and development underway in all organisations that have to implement restructuring plans based also on the integration of advanced computer technologies. More specifically, these professional skills are functional to the following career opportunities:
- industries producing and/or using computer components and systems;
- computer systems services companies and centres;
- suppliers of structures and services for IT networks and systems;
- suppliers of Internet computing and Web infrastructure services;
- software engineering companies;
- companies working in industrial automation and robotics;
- process industries in the mechanical, electrical, electromechanical, energy and chemical sectors;
- industrial research and development laboratories;
- technical departments of public administrations using IT infrastructure to manage internal and public services;
- training institutes;
- research centres.

With explicit reference to the type of businesses working in the Emilia-Romagna region, the career opportunities available for graduates in one of the highest concentrations of small and medium enterprises in the country is of great interest. The Emilia Romagna Region generally has an extremely advanced industrial system with a strong international vocation. The regional system is also characterised by highly developed traditional and advanced services structures, both in the private sector and within the civil service. The skills developed during the 2nd cycle degree programme in Computer Science and Computer Engineering are particularly requested and appreciated not only in the specific industrial sector, including computer consulting and software engineering companies, but also in a wider technological area covering electrical and electronics businesses, energy management, as well as chemical, civil and food processing sectors. Of particular relevance is the industrial automation sector, and specifically the automatic packaging machine manufacturers (which are so numerous that the Emilia-Romagna region has earned the international nick-name of "Packaging Valley").
The degree programme project has been submitted to selected external stakeholders in order to receive their opinions and feedbacks on the learning outcomes and the professional profiles.

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 third cycle studies (Dottorato di ricerca/Scuole di specializzazione) and master universitario di secondo livello.

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:

Bevilacqua, Alessandro
Boschetti, Marco Antonio
Bravetti, Mario
Callegati, Franco
Carbonaro, Antonella
D'Angelo, Gabriele
Franco, Annalisa
Golfarelli, Matteo
Maio, Dario
Maltoni, Davide
Maniezzo, Vittorio
Mingozzi, Aristide
Montefusco, Laura
Moro, Gianluca
Omicini, Andrea
Ricci, Alessandro
Rizzi, Stefano
Roli, Andrea
Viroli, Mirko
Zavattaro, Gianluigi

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.

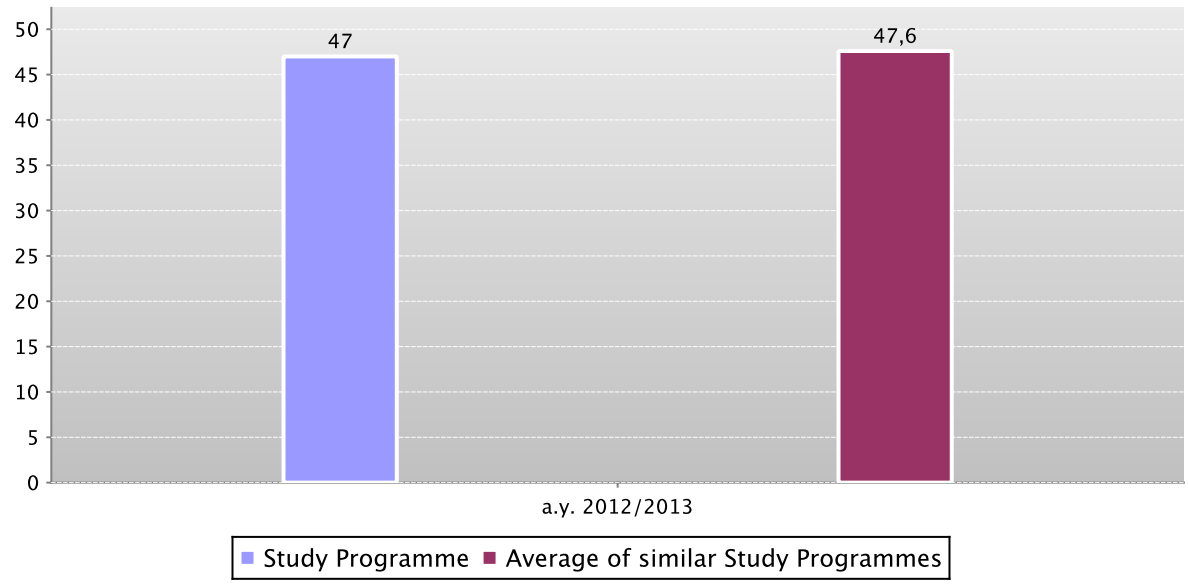
D.1. STUDENTS STARTING THEIR UNIVERSITY CAREERS

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. 2012/2013	
	New careers	Total N. enrolled students
Study Programme	47	57
Average of similar Study Programmes	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 homogeneous 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 2012/2013	Study Programme	47	42,6%	42,6%		10,6%	4,3%	87,2%	12,8%	34,0%	40,4%	25,5%
	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 2012/2013	Study Programme	100,0%				L-8 INGEGNERIA DELL'INFORMAZION L-31 SCIENZE E TECNOLOGIE INFORMATICHE	31,9%	21,3%	23,4%	21,3%	17,0%	17,0%	
	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

For Study Programmes reformed in academic year 2012/2013 the only data available refers to the previous programmes.

D.2.2. REGULAR GRADUATES

The new Study Programme running in compliance with D.M. 270/04 has not produced any graduates yet.

D.2.3. ADDITIONAL DATA ON REGULARITY OF STUDIES

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

For Study Programmes reformed in academic year 2012/2013 the only data available refers to the previous programmes.

D.2.3.2. EXAMS PASSED AND AVERAGE GRADE

For Study Programmes reformed in academic year 2012/2013 the only data available refers to the previous programmes.

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 new Study Programme running in compliance with D.M. 270/04 has not produced any graduates yet.

D.3.2 ADDITIONAL DATA ON OPINIONS OF STUDENTS

D.3.2.1. OPINION OF ATTENDING STUDENTS

???

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

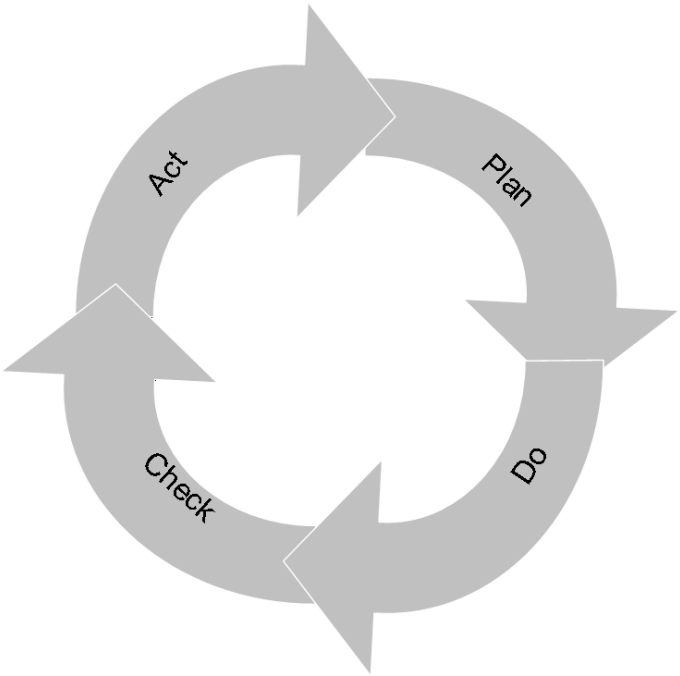
Data of Employment situation of graduates of Study Programmes reformed in compliance with D.M. 270/04 have not been collected yet.

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.