HEADING

Degree classification - Denomination and code:	L-31 Computer science
Degree title:	Dottore
Length of course:	3 years
Total number of credits required to complete programme:	180
Years of course currently available:	1st , 2nd , 3rd
Access procedures:	Cap on student, student selection based on entrance test
Course code:	F1X

PERSONS/ROLES

Head of Study Programme
   Prof. Giovanni Pighizzini

Degree Course Coordinator
   Prof. Paolo Boldi

Tutors - Faculty
   TUTOR PER L'ORIENTAMENTO:
   Stefano Aguzzoli
   Nicola Basilico
   Paolo Boldi
   Walter Cazzola
   Dario Malchiodi
   Stefano Montanelli
   Massimo Santini
   Andrea Mario Trentini
   Andrea Visconti

Degree Course website
   https://informatica.cdl.unimi.it/
 Via Celoria 18 - 20133 Milano   Phone 0250316250/252   Sportello in presenza: su appuntamento / Sportello telefonico: mercoledì dalle 9.30 alle 12.30 http://www.di.unimi.it/ecm/home/organizzazione/strutture-e-servizi/segreteria-didattica   Email: segreteria.didattica@di.unimi.it

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni
 Email: orientamento.uscita@di.unimi.it

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni   Email: orientamento@di.unimi.it

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni
 Email: tirocini.tesi.triennali@di.unimi.it

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni   Email: erasmus@di.unimi.it

 Via Celoria 18 - 20133 Milano   http://www.di.unimi.it/ecm/home/organizzazione/organi-di-governo/altre-commissioni   Email: trasferimenti@di.unimi.it

      Email: rappresentantistudenti@di.unimi.it

international.students@unimi.it

 Via Celoria 18 - 20133 Milano   Phone 0250325032   https://www.unimi.it/it/node/360 https://www.unimi.it/it/node/359/

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives
   The goals of the degree course in Computer Science are: on the one hand to provide a solid basic and methodological knowledge of the main sectors of computer science and mathematics and on the other to provide a good command of the methodologies and technologies of Computer Science, offering adequate background to learn and know the different

application areas of the discipline and to be able to assimilate, understand and evaluate the impact of the constant scientific and technological progress in the discipline. The degree program provides a broad common basis of activities, all aimed at preserving the homogeneity and cultural coherence expected of a Computer Science graduate. It is also given to the student a certain amount of freedom in the choice of a part of the courses in order to further investigate some topics of their own interest among those proposed by the course of study. For the realization of all the training objectives set out above, frontal lessons, practical exercises, labs and IT tools to support teaching are provided.

Expected learning outcomes
Acquisition of knowledge related to theoretical and applied computer science and its basic scientific fields:
- programming knowledge: procedural and object-oriented programming languages, problem solving, software engineering;
- knowledge of theoretical computer science: algorithms and data structures, formal languages;
- knowledge of architectures and systems: computer architectures, operating systems, databases, computer networks;
- mathematical knowledge: discrete mathematics, calculus, probability and statistics, mathematical logic.

Acquisition of methodological, technological and instrumental skills in the field of information sciences and their applications:
- scientific method: learning and use of the scientific method both through frontal lessons and through labs;
- modeling skills: ability to use advanced tools in the modeling of systems on various scales, from "large" systems up to applications that also require knowledge of hardware aspects and awareness of signal transmission problems;
- operational skills: ability to program a computer with different programming languages and in different application areas (scientific applications, commercial applications and industrial applications), ability to operate with the most popular operating systems and to configure network environments, capacity to apply computer security techniques;
- use of modern technologies: use of programming environments and tools, ability to use tools for configuring and managing systems and networks, ability to use tools for managing databases;
- ability to work in a group: developed in laboratory courses, during exercises and preparation of final tests for labs and within research groups, during work for the preparation of the final thesis.

Acquisition of conscious judgment autonomy through:
- autonomous execution of laboratory projects;
- relationship with teachers in the field of training activities and preparation of the final thesis;
- choice and preparation of the final thesis;
- ability to evaluate the impact of information technology on the ethical and social level.

Acquisition of adequate communication skills through:
- the acquisition of communication tools of various kinds (multimedia, online, etc.);
- the relationship with the teachers during internships;
- seminar activities in complementary courses;
- presentation of the final thesis;
- the study of a foreign language;
- participation in seminars and conferences hosted by the university's research facilities.

Acquisition of adequate learning skills for the development and deepening of further abilities, with reference to:
- research and consultation of bibliographic material for the preparation of exams and the final thesis;
- use during the courses and in the preparation of the final paper of databases, electronic journals and basic knowledge tools for the continuous updating of knowledge;
- achievement of a basic preparation and of an autonomy of study that allows the graduate to consult advanced textbooks and journals specialized in the research sectors characterizing Computer Science and scientific disciplines.

Professional profile and employment opportunities
The type of role that the degree course in Computer Science intends to train with a view to immediate placement is that of a graduate capable of collaborating with technical, operational and professional tasks in consultancy, analysis, design , management, maintenance, marketing of small and medium-sized IT systems. Graduates will be able to operate in the most varied application fields for the design and management of IT and telematic systems and for the study of new systems and applications.
This activity can be carried out in all areas of the public and private sector that use information technology. Therefore the main market segments concerned are: banks, insurance companies, logistics and transport, healthcare, public administrations, telecommunications and media, service companies, industry. More precisely, the graduate's specific roles and jobs, according to the ISTAT code, are listed below.
3.1.2 IT, telematics and telecommunication technicians
3.1.2.1 Programmer technicians
3.1.2.2 Application expert technicians
3.1.2.3 Web technicians
3.1.2.4 Database manager technicians
3.1.2.5 Network and telematic system manager technicians

The course allows to qualify for the following regulated professions: junior information engineer; graduate industrial expert.

Notes

In order to obtain their degree, students must be proficient in English at a B1 level under the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By a language certification, earned within three years prior to the date of submission, at a B1 level or higher. For the list of language certifications recognised by the University, please review: https://www.unimi.it/it/studiare/competenze-linguistiche/placement-test-test-di-ingresso-e-corsi-di-inglese). The certification must be uploaded during the enrolment procedure, or subsequently to the portal http://studente.unimi.it/uploadCertificazioniLingue;

- By a Placement Test, which is delivered by the University Language Centre (SLAM) during year I only, from October to December. Students who fail the test will be required to take a SLAM course.

The Placement Test is mandatory for all students who do not hold a valid certification.

Those who do not sit the Placement Test by December, or who fail to pass the end-of-course test within six attempts, must obtain an outside paid certification by graduation.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from the 27 EU member countries and other Extra-EU countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions.

Study and internships abroad

The education program can be enriched by educational activities abroad both to deepen some topics and as socialization experience in international environments. WIthin the Erasmus+ program study periods can be taken in over 50 universities in Belgium, Finland, France, Germany, Greece, Lithuania, Norway, Netherlands, Poland, Portugal, Czech Republic, Romania, Spain, Switzerland, Hungary. Courses will be recognized in the personalized study plan. These periods abroad are typically 5-month long and include courses for about 30 CFU, in the area of information and communication technology and related applications. Recognition of these educational activities will be based on the Learning Agreement, to be defined in advance by the student and the Erasmus coordinator at the Computer Science Department before starting the period abroad: course in the learning agreement with passed exams will replace the educational activities of the study plan ("manifesto"), either by covering the same topics or complementing the acquired basic competences. The Erasmus Committee at the Computer Science Department will perform the recognition of CFU obtained abroad and the definition of the personalized study plan. Similarly, stages to prepare the final dissertation are allowed in the same foreign universities. Recognition will be performed by the Department Erasmus Committee.

Erasmus: the coordinator for the Department of Informatics is Prof. Fabio Scotti

International Programs: the coordinator for the Department of Informatics is Prof. Vincenzo Piuri.

More information are available at the following link: http://www.di.unimi.it/ecm/home/didattica/international-studies

How to participate in Erasmus mobility programs

How to participate in Erasmus+ mobility programmes

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection generally begins around February each year with the publication of a call for applications specifying the destinations, with the respective programme duration (from 2/3 to 12 months), requirements and online application deadline.

Every year, before the deadline for the call, the University organizes informative meetings to illustrate opportunities and rules for participation to students.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which is supplemented by the University funding for disadvantaged students.

Language courses

Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University.

Learn more at https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus

For assistance, please contact:
International Mobility Office
Via Santa Sofia 9 (second floor)
Tel. 02 503 13501-12589-13495-13502
Contacts: InformaStudenti mobility.out@unimi.it
Student Desk booking through InformaStudenti

1st COURSE YEAR Core/compulsory courses/activities common

Learning activity		Ects	Sector
AUTOMATA AND FORMAL LANGUAGES		6	INF/01
COMPUTER ARCHITECTURE I		6	INF/01
COMPUTER ARCHITECTURE II		6	INF/01
COMPUTER PROGRAMMING		12	INF/01
CONTINUUM MATHEMATICS		12	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
DISCRETE MATHEMATICS		6	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
English assessment B1 (3 ECTS)		3	ND
MATHEMATICAL LOGIC		6	MAT/01, INF/01
	Total compulsory credits	57	

2nd COURSE YEAR Core/compulsory courses/activities common

Learning activity		Ects	Sector
ALGORITHMS AND DATA STRUCTURES		12	INF/01
COMPUTER PROGRAMMING II		6	INF/01
DATABASES		12	INF/01
OPERATING SYSTEMS		12	INF/01
STATISTICS AND DATA ANALYSIS		6	INF/01
	Total compulsory credits	48	

3rd COURSE YEAR Core/compulsory courses/activities common

Learning activity		Ects	Sector
COMPUTER NETWORKS		12	INF/01
SOFTWARE ENGINEERING		12	INF/01
	Total compulsory credits	24	

Further elective courses

Courses of the following Table 1, from which 12 CFU must be chosen, can be used by the student to complete his / her education both with respect to the physical-mathematical fundamentals (Physics, Operational research), and with respect to more specific topics to computer science disciplines (Languages programming, security and privacy).

	Ects	Sector
OPERATIONS RESEARCH	6	MAT/09
PHYSICS	6	FIS/03, FIS/02, FIS/01
PROGRAMMING LANGUAGES	6	INF/01
SECURITY AND PRIVACY	6	INF/01

Studentes must obtain 6 credits by choosing from the courses of Table 1 and Table 2 below.

	Ects	Sector
ALGORITHMS AND DATA STRUCTURES II *Alternate years course, not available in 21-22*	6	INF/01
ARTIFICIAL INTELLIGENCE I	6	INF/01
CRYPTOGRAPHY I	6	INF/01
DECLARATIVE PROGRAMMING	6	INF/01
DIGITAL IMAGE PROCESSING	6	INF/01
EMBEDDED SYSTEMS *Alternate years course, not available in 21-22*	6	INF/01
INFORMATION SYSTEMS	6	INF/01
LANGUAGES AND COMPILERS	6	INF/01
SCIENTIFIC VISUALIZATION	6	INF/01
TECNOLOGIES AND LANGUAGES FOR WEB	6	INF/01

Free choice courses.
Students will have to achieve 12 free CFU among the courses of the previous tables, among the following courses activated by the Department, or among all the courses activated by the university.

Students can request the recognition of credits for training activities at external institutions, presenting a certification. Each certification can give rise to a maximum of 3 credits, and up to 2 certifications can be recognized. The students who intend to request the recognition of the certifications must complete the "application" form available on the page https://www.unimi.it/en/study/student-services/welcome-desk-infostudenti/general-forms and send ver to the secretary of his / her degree together with a copy of the certifications achieved.

The evaluation will be carried out by a special commission based on the following parameters:

- Validity: the certification must have been obtained for a maximum of 5 years.

- Specificity: the object of the certification must be those referable to those required by the degree course in which the student is regularly enrolled.

- Specialization: the certification must concern specialized and / or professional skills.

- Level: the certification must attest to skills of a medium or advanced level. Basic and entry level certifications are excluded.

ADDITIONAL COURSES ACTIVATED BY THE EDUCATIONAL EDUCATIONAL COLLECTION OF INFORMATICS AVAILABLE FOR THE FREE SELECTION:

FUNDAMENTALS OF DIGITAL SOCIAL MEDIA	6	INF/01
SIGNAL PROCESSING	6	INF/01

End of course requirements

ECONOMICAL, ETHICAL, SOCIAL, AND LEGAL ASPECTS OF IT		3	NA
FINAL EXAM		3	NA
TRAINING		15	NA
	Total compulsory credits	21	

COURSE PROGRESSION REQUIREMENTS

The compulsory prerequisites between the courses are as follows:

Learning activity	Prescribed foundation courses	O/S
COMPUTER PROGRAMMING II	COMPUTER PROGRAMMING	Core/compulsory
OPERATIONS RESEARCH	DISCRETE MATHEMATICS	Core/compulsory
DATABASES	COMPUTER PROGRAMMING	Core/compulsory
ALGORITHMS AND DATA STRUCTURES	COMPUTER PROGRAMMING	Core/compulsory
PROGRAMMING LANGUAGES	COMPUTER PROGRAMMING	Core/compulsory
STATISTICS AND DATA ANALYSIS	CONTINUUM MATHEMATICS	Core/compulsory
OPERATING SYSTEMS	COMPUTER PROGRAMMING	Core/compulsory
SOFTWARE ENGINEERING	COMPUTER PROGRAMMING	Core/compulsory