UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2024/25
BACHELOR
Computer Science (Classe L-31)
enrolled from academic year 2018/19

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. ssa Sabrina Gaito

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/

Career Guidance Board
Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: orientamento.uscita@di.unimi.it

Course management
Via Celoria 18 - 20133 Milano Phone 0250316250/252 Sportello in presenza: mercoledì dalle 14.00 alle 16.00 / Sportello telefonico: giovedì dalle 9.30 alle 12.30 https://di.unimi.it/it/dipartimento/segreterie-e-servizi/ufficio-la-didattica
https://informastudenti.unimi.it/saw/ess?AUTH=SAML

Erasmus and International Student Board
Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: erasmus@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/

Internship and Bachelor's Degree Thesis Board
Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: commTesiL3@di.unimi.it

Programme Transfer Board
Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: trasferimenti@di.unimi.it

Student Orientation Board
Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: orientamento@di.unimi.it

Student representatives

Email: rappresentanti.studenti@di.unimi.it

Study Plan Board

Via Celoria 18 - 20133 Milano https://di.unimi.it/it/dipartimento/organizzazione/commissioni Email: piani.studio@di.unimi.it

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.
- IT, telematics and telecommunication technicians
- Programmer technicians
- Application expert technicians
- Web technicians
- Database manager technicians
- Network and telematic system manager technicians

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

Initial knowledge required

Qualifications and knowledge required for admission
In order to be admitted to the Bachelor's degree programme in Computer Science, you must have e high-school diploma or equivalent foreign qualification pursuant to Ministerial Decree no. 270 of 22 October 2004.

Admission assessment
Admission is capped in order to meet high-quality teaching standards relative to the available resources. Therefore, you will have to take a TOLC - CISIA Online Test before enrolling. There are 250 places available for the first year of the programme.
You may sit for the TOLC test at the University of Milan or any other member university of CISIA (Consortium of Inter-University Integrated Access Systems). Register to the TOLC test on the CISIA website (https://www.cisiaonline.it/).
The test providing access to the degree programme is TOLC-S, consisting of the following sections: Basic mathematics (20 questions - 50 minutes), Reasoning and Problems (10 questions - 20 minutes), Reading comprehension (10 questions - 20 minutes), Basic sciences (chemistry, physics and geology - 10 questions - 20 minutes).
Each question has 5 answer options, of which only one is correct.
Score: +1 for a correct answer, -0.25 for a wrong answer, 0 for a no answer.
Students who take the TOLC-S test and apply for admission to the programme will be included in a merit ranking based on the test score. The score will be weighted, for each section, according to the criteria set out in the call for applications. The winners may enrol within the deadlines.
The selection is divided into several time windows beginning in February and ending in early September.
Students who have not achieved at least 10 points in the Basics mathematics module will have to fulfil additional learning requirements (OFA).

The TOLC test includes an additional English section, consisting of 30 questions to be answered in 15 minutes. This section does not count toward the overall test score.

Detailed information, registration procedures, dates, deadlines and other information are published in the call for applications and at the following addresses:
https://www.unimi.it/en/study/enrolment
https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-first-degree-programme

Additional Learning Requirements and remedial methods (OFA)
Students with additional learning requirements will have to carry out remedial activities in the period October-December, and then take a test to prove they have filled their gaps. Otherwise, they may not take any second-year exams before passing the Continuum mathematics exam.
For information: https://informatica.cdl.unimi.it/it/studiare/le-matricole

Transfers and second degrees
Students who are already enrolled in a degree programme of the University of Milan or another University, as well as graduates, will be waived from the test requirement only if they meet the following requirements, based on academic records assessments:
- if, following academic records assessments, the student is awarded at least 30 credits of which 12 for Continuum Mathematics, he/she will be admitted to Year II with a waiver from the test requirement and with no additional learning requirements (OFA);
- if the student is awarded less than 30 credits, he/she student must register for the test.
To this end, they will have to submit a specific request for prior assessment of their academic records using the online service as shown in the call for applications.
These candidates must provide a full transcript of records (listing exams, subject areas, credits, grades) and attach the course syllabi. For more details, please refer to the call for applications.
The application for academic records assessment must be submitted within the deadline stated in the call for applications.
The assessment outcome will be notified by email by the date stated in the call.

Students admitted to years subsequent to the first must enrol in compliance with the deadlines and procedures specified in the call for applications.
Students admitted to the first year will be required to take the test and register for the call.

Compulsory attendance

Attendance is strongly recommended for both courses and laboratories.

Internship criteria

The internship is mandatory, is linked to the final paper and can be carried out on or off campus (at a company or another organization).
The internship experience normally consists of participating in a significant project, within which the student will independently carry out the activities assigned to him/her in accordance with the number of credits awarded for the internship under that programme (see "Manifesto degli studi").
The final paper must document the design and implementation aspects of the activity carried out, the professional or scientific skills learned, as well as its connections with the state of the art in the IT sector.
The internship must last at least 14 weeks (of which 2 for writing the paper).
Upon completion of the internship, the student will earn 15 CFU, subject to the positive opinion of the Academic Board.
For the student to start the internship, he/she must comply with all the provisions of the relevant regulations.
Find out how to apply for an internship, read internship regulations and more at https://informatica.cdl.unimi.it/it/studiare/stage-e-tirocini

Degree programme final exams

After earning the required academic credits, in compliance with the programme regulations, the student may sit the final exam and obtain their degree. Please refer to the University's Academic Regulations, for any other matters not covered herein. In accordance with the general criteria laid down by said regulations, the final exam may award students the remaining credits, and it will consist of a discussion of the final paper written by the student. This paper must be related to a theoretical or experimental activity carried out independently by the student in research groups or companies. The paper must document the design and implementation aspects of the activity carried out as well as its links with the state of the art in the IT sector.

Campus

IT course venues: via Celoria 18 - Milan.
Other course venues: Teaching sector, via Celoria 20; Teaching sector, via Golgi 19; Teaching sector, via Venezian 15.

Laboratories

Computer laboratory (Silab) at the Department of Computer Science, via Celoria 18, Milan.

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 submitting a language certificate attesting B1 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: https://www.unimi.it/en/node/39322). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal http://studente.unimi.it/uploadCertificazioniLingue;
- By taking a placement test offered by the University Language Centre (SLAM) between October and December of the first year. Students who fail the test will be required to take a SLAM course.
The placement test is mandatory for all those who do not hold a valid certificate attesting to B1 or higher level.
Those who have not taken the placement test by the end of December or fail the end-of-course exam six times must obtain the necessary certification privately before graduating.

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 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, Czech Republic, Finland, France, Germany, Greece, Hungary, Lithuania, Norway, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Switzerland, Turkey. 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. Davide Rocchesso.
More information are available at the following link: https://di.unimi.it/it/rapporti-internazionali/mobilita-internazionale/opportunita-internazionali

How to participate in Erasmus mobility programs

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 for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.
The University organizes informative meetings to illustrate mobility opportunities and rules for participation.
Erasmus+ scholarship
The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be 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 Language Centre (SLAM).
https://www.unimi.it/en/node/8/
Learn more at https://www.unimi.it/en/node/274/
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	(3) MAT/01, (3) 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).

INFORMATION AND CODING THEORY	6	INF/01
OPERATIONS RESEARCH	6	MAT/09
PHYSICS	6	(2) FIS/03, (2) FIS/02, (2) FIS/01
PROGRAMMING LANGUAGES	6	INF/01
SECURITY AND PRIVACY	6	INF/01

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

ALGORITHMS AND DATA STRUCTURES II *Alternate years course, available in 24-25*	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, available in 24-25*	6	INF/01
LANGUAGES AND COMPILERS	6	INF/01
MULTIMEDIA PUBLISHING	6	INF/01
QUANTUM INFORMATION AND COMPUTING	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.
It is not possible to choose courses activated by old study degrees.

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