UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22
BACHELOR
Computer Systems and Networks Security (Classe L-31)
enrolled from 2021/22 academic year

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
Access procedures:	Cap on student, student selection based on entrance test
Course code:	F68

PERSONS/ROLES

Head of Study Programme
Prof. Giovanni Pighizzini

Degree Course Coordinator
Prof. Danilo Bruschi

Tutors - Faculty
TUTOR PER L'ORIENTAMENTO:
Marco Anisetti
Claudio Agostino Ardagna
Andrea Lanzi
Giovanni Livraga
Gabriella Trucco

Degree Course website
https://ssri.cdl.unimi.it/

Via Celoria 18, 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

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CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The degree program aims to provide a broad and in-depth technological and methodological preparation in the IT area, with specific attention to topics in the cybersecurity and information privacy areas as well as a solid and methodological knowledge of the main areas of mathematics, physics, and the like, thus offering adequate preparation for assimilating, understanding and evaluating the impact of scientific and technological progresses within the Information technology area with particular focus on the cybersecurity and privacy fields. The graduate in Systems and Network Security will be able to face all the problems deriving from the creation of secure services both at infrastructural and application level. The course also aims to provide an in-depth operational knowledge that allows graduates to be engaged by professional subjects, either private or public, interested in the adoption of methodological and technological tools for improving the security of their IT services and infrastructures.

Expected learning outcomes

Knowledge and Understanding

Graduates in Systems and Network Security will have knowledge and methodological/operational skills in the following fields of IT security and data protection: cryptography, network and system security, information privacy, data protection, computer incident management. More precisely:
1. Knowledge of techniques for designing complex secure IT systems.
2. Knowledge of the methods and tools for the analysis of information systems, with particular reference to their security aspects.
3. Knowledge of the various aspects related to information privacy: legal, organizational and technological.
4. Knowledge of methods and techniques for the realization of safe services architectures.
5. Knowledge and understanding of organizational cybersecurity issues and their solutions.

Ability to apply knowledge and understanding

Graduates of the course will be able to apply the knowledge and skills acquired to analyse, to draw, to create and to evaluate secure and protected IT systems operating in various application areas: commercial, industrial, public administration, insurance, banking, hospital, environmental, energy and research. More precisely these are the expected learning outcomes:
1. Knowledge of a wide spectrum of application areas and cybersecurity solutions adopted in them.
2. Ability to analyze a specific problem whose solution requires the use of IT tools and to choose the most appropriate methods for its solution.
3. Ability to collect, evaluate and analyze empirical evidence relating to the behavior of an IT system.

Making judgments
Graduates of the course will acquire the ability to make independent and aware judgments about the design choices of a given cybersecurity architecture. They will also assimilate the principles of professional ethics and code of conduct which will guide their professional life.
Expected learning outcomes
1. Ability to reason critically and to question design and implementation choices.
2. Ability to develop autonomous and independent reasoning.
3. Awareness of the existence of different alternative technological approaches for the design and analysis of systems.
4. Ability to critically evaluate the relevance and merits of alternative projects.

Communication skills
Graduates of the course will be able to argue their ideas and communicate the results of their analysis and evaluations in a clear and effective way: in natural language, using the English language, and making use of the most up-to-date IT tools.
Expected learning outcomes
1. Written communication skills, based on the use of appropriate terminology and technical languages.
2. Ability to write a technical report in a clear, consistent and concise way.
3. Ability to formulate and express orally, even in public contexts, technical arguments.

Learning skills
The degree program aims to lead its students to a complete understanding of technical and methodological problems in the System and Network Security area. For this reason the course favors the development of learning skills by their students, as well as the acquisition of methodological skills and competences that allow them to independently undertake preliminary research activities as well as in-depth study. Students are also encouraged to consider a future enrollment in a master's degree program.
Expected learning outcomes
1. Ability to organize one's ideas critically and systematically.
2. Ability to identify, select and collect information through the appropriate use of the relevant sources.
3. Ability to use libraries, databases, digital and paper archives to access relevant information.
4. Ability to organize and implement an independent study plan.
5. Ability to reflect on one's own learning experience and to adapt it in response to suggestions and stimuli by teachers or colleagues.
6. Ability to recognize the need for further studies and to appreciate the role of innovative learning modalities.

Professional profile and employment opportunities

Cybersecurity Consultants
These professional figures operate in the business consultancy sector as a support to
companies in the analysis and resolution of IT security issues related to information system, data processing, system and network management, and applications development.
They carry out highly specialized professional activities in the field of business consultancy for both private and public companies which lack adequate computer security skills for correct and effective management of information systems as well as data processing systems.

IT technicians specialized in systems, networks and mobile devices security
Cyber security experts that inserted in the staff of a company bring the required skills for the secure management of databases, systems and networks equipment, PCs and mobile devices. The functions covered include: the management of access control policies and systems, the secure configuration and management of specific IT systems, the monitoring of a company IT systems and the management of technologies for disaster recovery and
business continuity.
The secure management of systems, networks and mobile devices is a corporate requirement spread horizontally on the large part of the industrial, public administration and services sectors. All large companies as well as small and medium-sized enterprises have an internal staff to manage their information systems, including proprietary data
and managerial and commercial transactions. Security and business continuity requirements are at the basis of the well functioning of such systems.

Specialized technicians in the analysis and development of secure software applications
The professional profiles included in this category belong to the professional profiles of software analysts and designers with particular skills regarding the use of methodologies
aimed at identifying security vulnerabilities and preventing security problems
in application. They are also experts in cryptographic techniques (algorithms and protocols) to be used for the protection of data.
Developing software according to security criteria and verifying the security of third party software are necessities now common to most software houses where this job profile is particularly required.

Specialized technicians in the analysis and development of secure web applications, multimedia, interactive and mobile applications
The professional profiles included in this category are web applications analysts and designers with specific skills regarding the security of applications characterized by strong interactivity and the use of mobile devices. These professionals integrate the ability to develop web applications with knowledge of the security problems and contribute to protect company assets from what is today the main channel of malicious code propagation, unauthorized accesses and computer crimes.
The increasing spread of e-commerce, web transactions between companies and the development of mobile apps for providing customer services makes these professional figures more and more relevant for all companies, both private and public and of any size and industrial sector, which have adopted web services as one of the main communication channels for their commercial presence or for the provision of services.

Technicians specialized in information and communication technologies
The professional profiles included in this category are experts in the management, deployment and use of information and communication technologies in the various operational contexts. These professionals integrate the ability to develop and maintain computer applications, even complex, with the knowledge of various application contexts (industrial automation, information systems, digital communication, decision support, etc.).
Graduates can operate in the many ICT application fields for the design, deployment and management of IT systems, and for the study of new architecture and/or applications

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**
COMPUTER ARCHITECTURE	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
CYBERCRIME LEGAL FRAMEWORK	6	IUS/17
CYBERSECURITY MANAGEMENT	6	INF/01
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
WEB AND MOBILE PROGRAMMING		6	INF/01
	Total compulsory credits	57	

2nd COURSE YEAR (available as of academic year 2022/23) Core/compulsory courses/activities common

Learning activity		Ects	Sector
ALGORITHMS AND DATA STRUCTURES		12	INF/01
COMPUTER NETWORKS		12	INF/01
CRYPTOGRAPHY		6	INF/01
DATABASES		12	INF/01
OPERATING SYSTEMS I		6	INF/01
OPERATING SYSTEMS II		6	ING-INF/05
STATISTICS AND DATA ANALYSIS		6	INF/01
	Total compulsory credits	60	

3rd COURSE YEAR (available as of academic year 2023/24) Core/compulsory courses/activities common

Learning activity		Ects	Sector
BIOMETRIC SYSTEMS		6	INF/01
COMPUTER FORENSICS		6	ING-INF/05
SECURE SOFTWARE DESIGN		6	INF/01
SYSTEM AND NETWORK SECURITY		6	INF/01
WEB AND MOBILE SYSTEMS SECURITY		6	INF/01
	Total compulsory credits	30	

Further elective courses

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:

MODEL-DRIVEN SOFTWARE DESIGN	6	INF/01

End of course requirements

ECONOMICAL, ETHICAL, SOCIAL, AND LEGAL ASPECTS OF IT		3	NA
FINAL EXAM		3	NA
FINAL STAGE		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
ALGORITHMS AND DATA STRUCTURES	COMPUTER PROGRAMMING	Core/compulsory
DATABASES	COMPUTER PROGRAMMING	Core/compulsory
OPERATING SYSTEMS II	COMPUTER PROGRAMMING	Core/compulsory
STATISTICS AND DATA ANALYSIS	CONTINUUM MATHEMATICS	Core/compulsory
OPERATING SYSTEMS I	COMPUTER PROGRAMMING	Core/compulsory