UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2019/20
BACHELOR
Computer Systems and Networks Security - online (Classe L-31)
enrolled from 2017/2018 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 , 2nd , 3rd
Access procedures:	Cap on student, student selection based on entrance test
Course code:	F1A

PERSONS/ROLES

Head of Study Programme
Prof. Giovanni Pighizzini

Head of Degree Course Coordination Council / Board
Prof. Giovanni Pighizzini

Degree Course Coordinator
Prof. Nello Scarabottolo

Tutors - Faculty
Chiara Braghin, Paolo Ceravolo, Stefano Ferrari, Nello Scarabottolo.

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

Via Celoria,18 - Milano Email: segreteria.didattica-milano@di.unimi.it

http://www.unimi.it/studenti/matricole/77516.htm

Via Celoria,18 - Milano Phone 199 188 128 https://www.unimi.it/it/studiare/servizi-gli-studenti/segreterie-infostudenti/sedi-e-orari-segreterie-studenti https://www.unimi.it/it/studiare/servizi-gli-studenti/segreterie-infostudenti

Email: papini@ctu.unimi.it

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 get their degree, students are required to certify their knowledge of the English language at the B1 level. This level can be certified in one of the following ways:
- By submitting their language certificate, taken no more than 3 years before its submittal and attesting a B1 or higher level (for the list of the language certificates which are accepted by the University of Milan, please refer to the website: http://www.unimi.it/studenti/100312.htm).
Students can submit their language certificate during the immatriculation procedure or send it to the Language Centre of the University of Milan (SLAM) via the Infostudente service.
- By sitting the placement test run by SLAM, during the first year exclusively, from September to December. Should they not pass the Placement Test, students will have to attend the English language course organized by SLAM. All students who do not have a valid language certificate must sit the Placement Test. Those students who do not sit the Placement test by December or do not pass the end of course test in one of the 6 attempts granted will have to get a language certificate outside the University of Milan within their degree.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports the international mobility of its students, offering them the opportunity to spend periods of study and training abroad, a unique opportunity to enrich their curriculum in an international context.

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.

How to participate in Erasmus mobility programs

To gain access to mobility programs for study purposes, lasting 3-12 months, the enrolled students of the University of Milan must attend a public selection that starts usually around the month of February each year through the presentation of specific competition announcements, which contain information on available destinations, respective duration of the mobility, requirements and deadlines for submitting the online application.

The selection, aimed at evaluating the proposed study abroad program of the candidate, knowledge of a foreign language, especially when this is a preferential requirement, and the motivations behind the request, is performed by specially constituted commissions.

Each year, before the expiry of the competition announcements, the University organises information sessions for the specific study course or groups of study courses, in order to illustrate to students the opportunities and participation rules.

To finance stays abroad under the Erasmus + program, the European Union assigns to the selected students a scholarship that - while not covering the full cost of living abroad - is a useful contribution for additional costs as travel costs or greater cost of living in the country of destination.

The monthly amount of the communitarian scholarship is established annually at national level; additional contributions may be provided to students with disabilities.

In order to enable students in economic disadvantaged conditions to participate in Erasmus+ program, the University of Milan assigns further additional contributions; amount of this contributions and criteria for assigning them are established from year to year.

The University of Milan promotes the linguistic preparation of students selected for mobility programs, organising every year intensive courses in the following languages: English, French, German and Spanish.

The University in order to facilitate the organisation of the stay abroad and to guide students in choosing their destination offers a specific support service.

More information in Italian are available on www.unimi.it > Studenti > Studiare all¿estero > Erasmus+

For assistance please contact:
Ufficio Accordi e relazioni internazionali
via Festa del Perdono 7 (ground floor)
Tel. 02 503 13501-12589-13495-13502
Fax 02 503 13503
E-mail: mobility.out@unimi.it
Desk opening hour: Monday-friday 9 - 12

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
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	L-LIN/12
WEB AND MOBILE PROGRAMMING	6	INF/01
WEB E MOBILE SYSTEM SECURITY	6	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 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 Core/compulsory courses/activities common

Learning activity		Ects	Sector
BIOMETRIC SYSTEMS		6	INF/01
COMPUTER FORENSICS		6	IUS/20
SECURE SOFTWARE DESIGN		6	INF/01
SYSTEM AND NETWORK SECURITY		12	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 http://www.unimi.it/studenti/segreterie/963.htm 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.

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 course contains the following obligatory or advised prerequisites

Learning activity	Prescribed foundation courses	O/S
DATABASES	COMPUTER PROGRAMMING	Core/compulsory
OPERATING SYSTEMS I	COMPUTER ARCHITECTURE	Recommended
	COMPUTER PROGRAMMING	Core/compulsory
OPERATING SYSTEMS II	COMPUTER ARCHITECTURE	Recommended
	COMPUTER PROGRAMMING	Core/compulsory
STATISTICS AND DATA ANALYSIS	CONTINUUM MATHEMATICS	Core/compulsory
	DISCRETE MATHEMATICS	Recommended
ALGORITHMS AND DATA STRUCTURES	CONTINUUM MATHEMATICS	Recommended
	DISCRETE MATHEMATICS	Recommended
	COMPUTER PROGRAMMING	Core/compulsory