UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22
MASTER DEGREE
Informatics Security (Classe LM-66)
Enrolled from 18/19 academic year

HEADING

Degree classification - Denomination and code:	LM-66 Computer science security
Degree title:	Dottore Magistrale
Curricula currently available:	Methods for information technology security / Safe systems
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Years of course currently available:	1st , 2nd
Access procedures:	Open, subject to entry requirements
Course code:	F2Y

PERSONS/ROLES

Head of Study Programme
Prof. Giovanni Pighizzini

Degree Course Coordinator
Prof. ssa Sabrina de Capitani di Vimercati

Tutors - Faculty
TUTOR PER L'ORIENTAMENTO:
Valentina Ciriani
Fabio Scotti

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

via Celoria 18, Milano Phone 02503 16250/252 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 masterly degree in Informatics Security aims at supplying the advanced knowledge required for professionals who will carry on research, design, implementation, verification, coordination and management of ICT systems where security and protection of the systems themselves as well as of the information they handle are crucial issues.

The masterly graduated in Informatics Security will also have the skills necessary to handle the innovation in the ICT field: to this purpose, she/he will have high-level scientific and technical competencies, methodological and operating capabilities, critical and open perspective view regarding adoption and usage of secure ICT technologies.

The masterly degree in Informatics Security foresees a graduation thesis, to be developed inside the University as well as in a private or public company and to be discussed as the final examination. The thesis is a written relation (English or Italian)

structured as a scientific publication, prepared with the help of a supervisor and describing an original scientific experience in the field of ICT security.
The degree has been designed to be proficiently followed both by people already acquainted with ICT security issues (to whom it will provide deeper insight into ICT sciences and technologies useful for security critical application) and by people coming from scientific degrees where computer security has never been specifically addressed (to whom it will supply t required competencies starting from basic aspects of ICT security). In both cases, however, training is structured around a large common basis, preserving the uniqueness of the overall degree and guaranteeing homogeneity and cultural coherence of the graduated people.
The training foresees lectures, practical exercises, laboratory courses and ICT learning support tools.

Expected learning outcomes

KNOWLEDGE AND UNDERSTANDING

Graduates in Information Security master?s degree will have advanced knowledge and skills in:
- cryptography
- network security
- security of service-oriented architectures
- data protection
- system modeling and analysis
- biometric systems
- risk analysis and management
- business organization
- processing of personal and sensitive data
- management of IT incidents

Expected learning outcomes:

1. Knowledge of methods, principles and conceptual systems, for the study and design of complex secure computer systems
2. Knowledge of methods and tools for analysis and formal synthesis of systems, with particular reference to their safety
3. Knowledge of the problems related to sensitive data processing, its legislation and organizational aspects
4. Knowledge of methods and principles for the implementation of secure service-oriented architectures
5. Knowledge and understanding of organizational problems and solutions relating to IT security
6. Knowledge of the main research results and research lines of the most important theoretical developments in one or more disciplinary sub-domains and research fields related to information security

APPLYING KNOWLEDGE AND UNDERSTANDING

Graduates of the course must be able to apply the knowledge and skills acquired to the analysis, design, implementation and evaluation of secure and protected IT systems operating in various areas: commercial, industrial, public administration, insurance, banking, hospital, environmental, energy, research.
They must also be able to use their cognitive tools to analyze and evaluate from a professional point of view - within companies, public and private research centers, governmental bodies, as well as regulatory authorities. control and guarantee - the correctness and conformity of design choices as well as the effects of decisions on the correct functioning of IT systems and the necessary data protection guarantees.

Expected learning outcomes:

1. Knowledge of a broad spectrum of application areas and related solutions
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 analyze and model a complex system and synthesize its behavior
4. Ability to collect, evaluate and analyze empirical evidence relating to the behavior of a computer system. 5. Ability to compile systematic bibliographies and to provide bibliographic references consistent with the conventions accepted by the scientific communities of reference

MAKING JUDGEMENTS

Graduates of the course must be able to formulate fully autonomous and conscious judgments regarding the decisions and design choices of the companies, organizations in which they will operate. They will also have to fully assimilate the principles of professional ethics that guide interpersonal relationships in the reference occupational contexts in which they may encounter in the professional life following the achievement of the master's degree.

Expected learning outcomes:

1. Ability in critical thinking about design and implementation choices
2. Ability to develop autonomous and independent reasoning and reflections
3. Awareness of the existence of various alternative methodological approaches for the design and analysis of systems, understanding the relevance of this plurality
4. Ability to critically evaluate the relevance and merits of alternative projects
5. Ability to critically evaluate and interpret evidence

COMMUNICATION SKILLS

Graduates of the course must be able to argue their positions and communicate the results of their analysis and assessments in a clear and effective way, using the most common working language in international working contexts (English) and making use, with full technical mastery of the most up-to-date IT tools, as well as the most advanced tools (IT, mathematical, statistical, econometric) for the analysis, processing and presentation of data.

Expected learning outcomes:

1. Written communication skills, based on the use of appropriate technical terminology and languages
2. Ability to present and critically evaluate in writing in a clear, coherent and concise manner, technical and methodological ideas and arguments
3. Ability to formulate and express orally, even in public contexts, complex arguments in the technical and methodological field
4. Ability to develop an original research dissertation on a complex topic in a complete and coherent manner, also using appropriate technological supports

LEARNING SKILLS

The master's degree course aims to gradually lead its students to the research fields; this is why the course intends to favor the development of further learning abilities by its students as a priority, as well as the acquisition of methodological and theoretical skills and competences that allow their master's graduates to independently undertake the field of scientific research according to international standards, and also in order to foster doctoral programs in the IT field and other related fields.

Expected learning outcomes:

1. Ability to organize ideas in a critical and systematic way
2. Ability to identify, select and collect information through the appropriate use of relevant sources
3. Ability to use libraries, databases, archives, paper and electronic repertories to access relevant scientific and documentary 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 from teachers or colleagues
6. Ability to recognize the need for further study and to appreciate the role of innovative learning modalities and additional research activities
7. Ability to design and develop independent research work, albeit guided by a supervisor

Professional profile and employment opportunities

Competencies acquired by people who obtained the masterly degree in Informatics Security are typical of high responsibility job positions in all projects requiring consultancy, analysis, design, management, marketing of medium-large information systems.
These job positions will be available in all kinds of private and public companies using ICT technologies and requiring particular attention to security and privacy issues.
More in detail, referring to the ISTAT 2008 Professional Classification scheme, the masterly degree in Informatics Security will prepare:
2114 Informatics and Telecommunication specialists
21141 Basic ICT research specialists
21142 System and application software analysts and designers.
21143 System analysts
21144 ICT security experts
21145 Computer network specialists
26200 Mathematical and computer sciences researchers

Notes

In order to obtain their degree, students must be proficient in English at a B2 level. This proficiency level may be certified as

follows:
- By a language certification, earned within three years prior to the date of submission, at a B2 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-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 SLAM during year I only, from October to January. 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 January, or who fail to pass the end-of-course test within six attempts, must obtain an outside paid certification by graduation.
- Level of English assessed by SLAM (and/or through a computer-based test) during the bachelor's degrees obtained at the University of Milan. English levels B1 and B2 achieved no more than four years previously are deemed valid. The verification is automatic with no need to attach any certificate during the application phase.

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 to all curricula

Learning activity		Ects	Sector
COMPLEMENTS OF SECURITY AND PRIVACY		6	INF/01
English proficiency B2 (3 ECTS)		3	ND
PRIVACY AND DATA PROTECTION		6	INF/01
RISK ANALYSIS AND MANAGEMENT		6	INF/01
SERVICE-ORIENTED ARCHITECTURE SECURITY		6	INF/01
SYSTEM MODELING AND ANALYSIS		6	INF/01
	Total compulsory credits	33	

2nd COURSE YEAR Core/compulsory courses/activities common to all curricula

Learning activity		Ects	Sector
ORGANIZATION		6	SECS-P/10
PROCESSING OF SENSITIVE DATA		6	IUS/01
	Total compulsory credits	12	

Further elective courses common to all curricula

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.

The above requests can only be submitted by students who have not already obtained these awards during the three-year course.

NETWORK SECURITY II		6	INF/01

End of course requirements common to all curricula

FINAL EXAM		39	NA
	Total compulsory credits	39	

ACTIVE CURRICULA LIST

Methods for information technology security Course years currently available: 1st , 2nd
Safe systems Course years currently available: 1st , 2nd

CURRICULUM: [F2Y-A] Methods for information technology security

Qualifying Training Objectives

The specific objective of this curriculum is to provide knowledge in fundamental and useful information sciences and technologies for the management of security problems to students who come from a degree in the computer science class

and who have already acquired knowledge in the main security technologies. Please note that this curriculum must be chosen by three-year graduates in computer systems and network security and cannot be chosen by graduates in other three-year degree courses of the IT class of the University of Milan.

1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Methods for information technology security			
Learning activity		**Ects**	**Sector**
ADVANCED BIOMETRICS		6	INF/01
INFORMATION SYSTEM SECURITY MANAGEMENT		6	ING-IND/35
LOGIC		6	INF/01
	Total compulsory credits	18	

Further elective courses Curriculum-specific features Methods for information technology security		
Students must choose 6 credits from the following courses:		
ARTIFICIAL INTELLIGENCE	6	INF/01
DEPENDABILITY	6	ING-INF/07
INFORMATION MANAGEMENT	6	INF/01

CURRICULUM: [F2Y-B] Safe systems

Qualifying Training Objectives

The specific objective of this curriculum is to provide knowledge in cyber security issues starting from the basics to students who come from a scientific degree but who have limited previous knowledge on security issues. Please note that this curriculum cannot be chosen by three-year graduates in computer systems and networks security.

1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Safe systems			
Learning activity		**Ects**	**Sector**
BIOMETRIC SYSTEMS		6	INF/01
COMPUTER FORENSICS		6	ING-INF/05
CRYPTOGRAPHY		6	INF/01
NETWORK SECURITY		6	INF/01
	Total compulsory credits	24	