UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22
BACHELOR
Music Information Science (Classe L-31)
enrolled from 2014/2015 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:	F3X

PERSONS/ROLES

Head of Study Programme
Prof. Giovanni Pighizzini

Degree Course Coordinator
Prof. Federico Avanzini

Tutors - Faculty
TUTOR PER L'ORIENTAMENTO:
Federico Avanzini
Goffredo Haus
Luca Andrea Ludovico
Marco Mesiti
Elena Pagani

Degree Course website
https://informaticamusicale.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 is organized in a single learning path, which guarantees homogeneity and cultural coherence of the graduates, both when entering the job market after graduation and when continuing with a subsequent degree programme, with specific reference to the master degrees belonging to the LM-18 Informatica class.

The main learning goal of the degree is to provide solid general cultural skills aimed at in-depth disciplinary competences of the main areas of information technologies for musical heritage, multimedia, internet and databases, complemented by elements of semiotics and formal linguistics, and on thorough practical and theoretical mastering of multidisciplinary methodologies and technologies related to the multifaceted aspects of music informatics. The objective is to ensure that graduates have a solid cultural and methodological background aimed at both continuing academic studies and providing skills and the tools to assimilate scientific and technological advancements and to tackle at an advanced level problematics

related to the applications of computer science and information technologies to music.
An equally important learning goal of the degree is to provide specific vocational education, focused on solid competences as well as on applicative and operating abilities, which are immediately expendable in the job market, with specific reference to the transfer and application of scientific and technological know-how to music. Vocational learning goals are aimed at forming graduates that have technical-operating competences, experts in specific application domains (communication, publishing, musical and multimedia production and post-production, new media, e-commerce, television, wired and mobile telecommunications, advertising, cultural heritage, pedagogy).

Expected learning outcomes

Knowledge and understanding.
Theoretical and operating know-how, ability to understand and use formal and informatic methods to support applications in the musical domain, fundamental knowledge of continuous and discrete mathematics, acoustics, and computer science.
Expected learning outcomes
- Knowledge of methods, principles, and conceptual systems, for the study and the design of information systems for musical, audio, and generally multimedia applications.
- Knowledge of methods and tools for the formal coding, the analysis, and the synthesis of music information, as well as the informatic tools for its processing.
- Understanding and mastering of the tools and of the main quantitative methods used for the analysis and the representation of data and knowledge in the music field.
- Knowledge of methods and principles for the realization of systems for the automatic processing of musical musical, audio, and generally multimedia information.
- Knowledge of the main research results and of the most important theoretical developments in one of more disciplinary sub-domains and research fields.

Applying knowledge and understanding.
Acquisition of methodological, technological, and instrumental competences, to be applied to various musical application domains.
- Knowledge of a vast body of application domains and related solutions.
- Ability to logically analyze a specific problem whose solution requires to employ information technologies and to choose the most appropriate methods for its solution.
- Ability to analyze and to model a complex systems and to synthesize its behavior.
- Ability to collect, evaluate, and analyze empirical evidence related to the behavior of a specific information system in the music field.
- Ability to compile systematic bibliographies and to provide bibliographic references, complying with the accepted rules of the related scientific communities.

Making judgements
Acquisition of full ability to formulate independent and mature judgements.
- Critical reasoning and ability to discuss design and implementation choices.
- Ability to develop independent lines of thought.
- Awereness about the existence of different and alternative approaches to the design and analysis of systems, understanding of the relevance of such plurality.
- Ability to evaluate and interpret objective and subjective experimental data.
- Ability to critically evaluate the relevance and the merits of alternative projects.
- Ability to evaluate and critically interpret evidence.

Communication skills.
Acquisition of adequate competences and tools for communication.
- Written communication, based on the use of appropriate terminology and technical jargon.
- Ability to present and critically evaluate ideas and technical and methodological arguments, in written form, in a clear, coherent, and concise way.
- Ability to formulate and to express in oral form, even in public contexts, complex technical and methodological arguments.
- Ability to develop completely and coherently an original research dissertation on a complex topic, also by means of appropriate technological supports.

Learning skills.
Acquisition of adequate abilities to independently deepen their knowledge.
- Ability to organize ideas in a critical and systematic way.
- Ability to identify, select, and collect information through appropriate use of relevant sources.
- Ability to use libraries, data bases, archives, physical or electronic, to access to relevant information, also for continuous update of knowledge.
- Ability to organize and realize an independent learning plan.
- Ability to reflect on own learning experience and to adapt it in response to hints and stimuli coming from teachers or colleagues.
- Ability to recognize the need for further studes, and to appreciate the role of innovative learning modalities and additional

research activities.
- Ability to design and develop an independent research work, though under the guidance of a supervisor.

Professional profile and employment opportunities

Expert of information technologies for music in the publishing and recording industry, web, and new media.
Role in a professional context.
Professional figures in this category manage activities related to design and development of services and systems based on integrating technological solutions for music publishing, such as processing, retrieval, and preservation of music information.
Associated competences.
They have in-depth knowledge of methodologies and technologies related to musical heritage, music and multimedia production and post-production, social and economic implications related to the development of web and multimedia systems as well as the effects of their adoption by user communities.
Employment opportunites.
They are able to work individually as consultants, or in a team within public or private enterprises, in a job market that is rapidly evolving regarding both technological and communication aspects.

Expert in information technologies for the analysis, processing, and synthesis of sound and music information.
Role in a professional context.
Professional figures in this category manage activities related to design and development of services and systems based on integrating technological solutions for:
- digital processing of audio signals and music symbols in the field of recording, production, post-production, reproduction, visualization, restoration of supports and contents;
- classification and retrieval of audio and music contents
Associated competences.
They have in-depth knowledge of methodologies and technologies related to representation, processing, automatic recognition of features of music information (audio, audio-video, sheet music, catalogues, music structures, MIDI, ...), with specific reference to fields related to human-computer interaction, and web and multimedia systems.
Employment opportunites.
They are able to work individually as consultants, or in a team within public or private enterprises, in a job market that is rapidly evolving regarding both technological and communication aspects.

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
ACOUSTICS	9	FIS/03, FIS/02, FIS/01
COMPUTER ARCHITECTURE I	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
ELEMENTS OF MUSICAL GOODS ECONOMICS	6	SECS-P/07
English assessment B1 (3 ECTS)	3	ND
MODELS OF MUSIC PERCEPTION	6	M-PSI/01
MUSIC SEMIOTICS	6	M-FIL/05
Total compulsory credits	60	

2nd COURSE YEAR Core/compulsory courses/activities common

Learning activity	Ects	Sector
ALGORITHMS AND DATA STRUCTURES	6	INF/01
COMPUTER SCIENCE APPLIED TO MUSIC	18	INF/01
COMPUTER SCIENCE APPLIED TO SOUND	12	INF/01
DATABASES	6	INF/01
OPERATING SYSTEMS	6	INF/01
SIGNAL PROCESSING	6	INF/01

STATISTICS AND DATA ANALYSIS		6	INF/01
	Total compulsory credits	60	

3rd COURSE YEAR Core/compulsory courses/activities common

Learning activity		Ects	Sector
COMPUTER NETWORKS		6	INF/01
ELEMENTS OF MUSICAL INFORMATION LAW		6	IUS/01
METHODS AND TECHNOLOGIES OF MUSIC PUBLISHING		6	SPS/08
WEB PROGRAMMING		6	INF/01
	Total compulsory credits	24	

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.

CRYPTOGRAPHY I	6	INF/01
DECLARATIVE PROGRAMMING	6	INF/01
DIGITAL IMAGE PROCESSING	6	INF/01
INFORMATION SYSTEMS	6	INF/01
LANGUAGES AND COMPILERS	6	INF/01
MULTIMEDIA INFORMATION	12	INF/01
OPERATIONS RESEARCH	6	MAT/09
PROGRAMMING LANGUAGES	6	INF/01
SCIENTIFIC VISUALIZATION	6	INF/01
SECURITY AND PRIVACY	6	INF/01
Table 1. Students must obtain 6 credits from the following courses for the guided choice.		
DEVELOPMENT OF MUSIC PRODUCTION TECHNOLOGIES	6	INF/01
DISCRETE MATHEMATICS	6	MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08
NEW MEDIA SOCIOLOGY	6	SPS/08

End of course requirements

FINAL EXAM		3	NA
TRAINING		15	NA
	Total compulsory credits	18	

COURSE PROGRESSION REQUIREMENTS

The compulsory prerequisites between the courses are as follows:

Learning activity	Prescribed foundation courses	O/S
SIGNAL PROCESSING	CONTINUUM MATHEMATICS	Core/compulsory
COMPUTER SCIENCE APPLIED TO SOUND	COMPUTER PROGRAMMING	Core/compulsory
WEB PROGRAMMING	COMPUTER PROGRAMMING	Core/compulsory
STATISTICS AND DATA ANALYSIS	CONTINUUM MATHEMATICS	Core/compulsory
ALGORITHMS AND DATA STRUCTURES	COMPUTER PROGRAMMING	Core/compulsory