Generalità

<table>
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<tr>
<th>Classe di laurea di appartenenza:</th>
<th>LM-6 BIOLOGIA</th>
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<tbody>
<tr>
<td>Titolo rilasciato:</td>
<td>Dottore Magistrale</td>
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<tr>
<td>Durata del corso di studi:</td>
<td>2 anni</td>
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<td>Crediti richiesti per l’accesso:</td>
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<td>Cfu da acquisire totali:</td>
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<td>Modalità accesso:</td>
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<tr>
<td>Codice corso di studi:</td>
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</tbody>
</table>

Riferimenti

Presidente Collegio Didattico  
Prof. Mirko Baruscotti

Coordinatore Corso di Laurea  
Prof.ssa Luisa Guerrini (luisa.guerrini@unimi.it)

Docenti tutor  
Prof.ssa Lucia Colombo, Martino Bolognesi, Anna Moroni, Marco Muzi Falconi

Sito web del corso di laurea  
http://www.ccdbiol.unimi.it

Matriculation and enrollment  
http://www.unimi.it/ENG/admission/92320.htm

MBC email  
Email: bmc@unimi.it

Student administrative office  
via Celoria, 22. Tel. (0039) 199188128/From abroad: 0039 056676357. Students Information Service:  
http://www.unimi.it/ENG/student/52904.htm E-mail: www.unimi.infostudente.it

Student information office  
Via Celoria, 26 – 2nd floor, tower A Opening times: from Monday to Friday, 10-11:45  
http://www.ccdbiol.unimi.it Email: cl.biol@unimi.it

Caratteristiche del corso di studi

Premessa  
The Department of Biosciences (DBS) at the Università degli Studi di Milano is the reference point and the main Institution responsible for the MBC Master Degree course.

Obiettivi formativi generali e specifici  
The MBC course covers all principal areas of the LM-6 Biology course, with a particular focus on biomolecular subjects, thus distinguishing it from other courses from the same LM Class. The main goal of the MBC course is to train biologists in advanced biomolecular research and to allow them to address present and future scientific challenges. An in-depth and up-to-date knowledge will be provided for the following subjects: molecular genome analysis; regulation of gene expression; structure and function of biological macromolecules and their interactions in supramolecular complexes; cellular communication, signal perception and transduction, metabolic regulation, biomolecular engineering and computing. Both theoretical and practical aspects of biomolecular research will be addressed. Graduate students will learn to apply novel and emerging research technologies/approaches, cutting-edge data acquisition systems and analysis, and will have hands-on experience with top-level nanotechnology, hosted in the research laboratories of the DBS. MBC graduates will be perfectly suited for entering a PhD school for advanced education.

Abilità e competenze acquisite
According to the Dublin Descriptors, expected learning outcomes are:

**KNOWLEDGE AND UNDERSTANDING.** Comprehensive knowledge in specific areas of molecular and cellular biology: protein biochemistry, microbiology and genetics, biomedicine and bioinformatics. These subjects, previously introduced during the bachelor degree program, are studied in depth in the Master degree program.

**APPLYING KNOWLEDGE AND UNDERSTANDING.** Skills to address complex issues and to carry out research activities in the specific fields of molecular and cell biology, genetics and microbiology and in related areas of research in chemistry, biomedicine and bioinformatics. Skills to carry out analysis and characterization of complex bio-molecular systems by using innovative procedures and state-of-the-art instruments. Skills to rationally and systematically interpret data obtained from laboratory observations and measurements. Learning up-to-date methodologies for biological analysis and data processing; the development of interpretative models will be assessed throughout the duration of the experimental work involved in the Master thesis and during the writing of the dissertation. Profound knowledge and awareness of bio-safety, the appropriate procedures for chemical waste management, and of existing laws and regulations, will also be acquired.

**DECISION-MAKING.** Acquiring independent judgment regarding: interpreting experimental data and mastering the appropriate tools in relation to different scientific and technical disciplines; designing and implementing complex experiments, by managing time and procedures; assessing and quantifying final outcomes; directing projects, structures and personnel; identifying new perspectives and innovative development strategies; evaluating, interpreting and revising literature research data; professional deontology; ability to formulate analytical problems and to propose ideas and innovative solutions; information-retrieval skills, in relation to primary and secondary information sources, including information retrieval and evaluation on chemical topics through on-line computer searches.

**COMMUNICATION SKILLS.** Skills to comprehensively communicate research results, conclusions and related knowledge and rationale, to specialist and non-specialist audiences in molecular and cell biology. Ability to communicate accurately and fluently in English with foreign partners.

**LEARNING SKILLS.** Acquiring adequate skills for the development and improvement of competences in a self-directed and independent way, in relation to the ability to conduct on-line literature searches by accessing databases and online information. Achieving competence in the use of all instruments and methodologies, which allow personal knowledge to be continuously updated. Such skills that include the identification of specific information both in the area of molecular and cell biology (specialized texts, scientific journals etc.) and in related and complementary disciplines (also of legal and/or economic character), are essential for the management of complex projects.

The skills listed above will be achieved through lectures, guided and independent study and through an extended period of laboratory internship for the preparation of the final dissertation. The achievement of course-specific educational goals will be assessed: through regular written and/or oral exams; during the experimental thesis work and writing the dissertation; by evaluating students’ awareness and participation in the educational activities and critical thinking skills. The evaluation commission at the final dissertation will also assess the skills of the student in presenting, explaining and discussing his/her work in proper scientific terms.

**Profilo professionale e sbocchi occupazionali**

The MBC graduate will have acquired has specialized and extensive knowledge in the field of molecular and cell biology, and competences in related analytical methodologies and experimental techniques. He/she will be particularly knowledgeable about the comprehension of complex biomolecular systems and of their applications in the biomedical and pharmaceutical industry, as well as about their transfer to society in relation to food, environment and cultural assets conservation.

The MBC Master Degree course provides the necessary training to independently practice biology, or to be employed in:

- basic and applied research activity in universities and in other public or private research centers;
- biomedical and pharmaceutical industries, spin-off and startup companies for self-directed and independent work, enabling graduates to hold positions of responsibility in the implementation of research projects;
- promotion and development of the scientific and technological innovation;
- planning and management of industrial technologies;
- functions of high responsibility in the industrial, environmental, health care, and public service sectors;
- biology teaching at all levels.

In addition, graduates will access sectors such as environmental science, scientific dissemination, intellectual property (patents) and business management. Moreover, full immersion English courses, provided by MBC, will allow graduates to perform equally well in job seeking in Italy and abroad.

The MBC graduate can be legally admitted to the “A Section” of the National Biologists Register. Indicatively, the different sectors of the labor market accessible to Master graduates are hereafter outlined, with reference to the intellectual, scientific and highly-specialized professions provided by the ISTAT 2008, NUP Isfol-Istat Classification of Professions:

- Biologists and related professions - (2.3.1.1.1)
- Researchers and technicians graduated in the area of biological sciences - (2.6.2.2.1)

**Conoscenze per l’accesso**

For admission to the MBC course, students must meet curriculum requirements and have suitable background knowledge (DM 270/04).

Entry is open to:

- Graduates in Biological Sciences (Class L-13) from any Italian University that follows CBUI rules, as adequately certified (www.cbui.unito.it). In this case, credits acquired by the candidate as an undergraduate will be fully recognized and will
meet the curricular prerequisites.
- Biological Sciences (Class L-13) graduates from Universities that do not follow CBUI rules, graduates in other related
areas and foreign graduates, who have acquired a title equivalent to the I level degree by Italian law, are requested to have
earned at least 90 CFU in Biological Sciences (of Class L-13) subjects, including: basic subjects (such as mathematics,
physics, statistics, informatics) and biological subjects (such as biochemistry, molecular biology, genetics, microbiology,
general physiology, plant biology, developmental biology, others).

Students lacking adequate curricular requirements can contact the Coordinator of the Master course well in advance in order
to plan acquisition of the requested CFU before the application deadline. The lacking CFU can be acquired by passing the
relevant exams at the University of Milan or any other University.
The candidate’s background knowledge in Biology will be verified by an interview.
For all students, the minimum requirement for knowledge of the English language is B1 level ("lower intermediate") of the
Common European Framework of Reference (CEFR) for Languages or equivalent certification.

**Struttura del corso**
The duration of the MBC Master degree program is two years, each year is subdivided into two semesters.
120 educational credits (CFU) are required to complete the Master. Each credit corresponds to a standard student workload
of 25 hours, including:
- 8 hours of lectures followed by 17 hours of individual study;
- 16 hours of practical labs followed by 9 hours of individual study;
- 25 hours of training activities related to the thesis.

The curriculum includes mandatory, guided and open-choice courses. Subject choices are made as follows:
- 7 mandatory courses (45 CFU in total);
- 3 guided-choice courses on principal subjects (18 CFUs in total);
- 2 open-choice courses (12 CFUs in total), which may be freely selected by the student from all the courses offered by the
University (including the MBC courses in the guided-choice list, which have not already been selected), provided that they
are coherent with the study plan. If unavailable in English, open-choice courses can be taken in Italian.

In the first year (I and II semesters), students are encouraged to acquire credits by following at least 8 distinct courses. 3
CFUs will be assigned for English language skills.
During the second year, the workload is centered on the experimental research activity related to the thesis (42 CFU in total,
12 of laboratory training and 30 acquired upon the final thesis exam) and on one course regarding laboratory methods.

**Obiezione di coscienza**
In the MBC Master degree the use of animals for teaching purposes is not allowed as stated by the law: art. 5f of the
Legislative Decree 26/2014. Such procedures are allowed during the traineeships for thesis preparation. However, they must
be carried out exclusively by authorized staff, since, in this case, the Legislative Decree 26/2014 does not apply. According
to Italian law n. 413, October 12 1993, “Norme sull’obiezione di coscienza alla sperimentazione animale”, students have the
uncontestable right to conscientiously object to participation in any experimental activity using animals. In this case, the
Teaching Board will suggest alternative traineeships, that are consistent with the educational goals of the MBC course, to
ensure the correct acquisition of the study credits necessary for degree completion.

**Area didattica**
Classrooms are located in the University buildings in: Via Celoria, 26 (Edifici Biologici); Via Celoria, 20 (Settore
Didattico); Via Golgi, 19 most laboratories are located in the Department of Biosciences, Via Celoria 26, 20133 Milano.

**Biblioteche**
Biblioteca Biologica Interdipartimentale (Via Celoria, 26).

**Tutorato**
Tutors will provide students with academic advice, guidance on their course choices and advice on where and how to seek
help with personal problems.

**Attività obbligatorie**
All above-mentioned training activities, including mandatory, guided and open-choice courses, and experimental research
activities during the thesis internship, are compulsory for completing a Master Degree.

**Prove di lingua / Informatica**
In order to get their degree, students are required to certify their knowledge of the English language at the B2 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 B2 o 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 February. 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
**Caratteristiche Tirocinio**

- **Formulazione e presentazione piano di studi**
- **Regole generali per iscrizione e ammissione agli appelli d’esame**
- **Modalità di valutazione del profitto**
- **Obbligo di frequenza**

**Supervisor must meet the student periodically and to critically evaluate his/her work progress.**

The MBC Coordinator will ensure that every student is assigned to a laboratory for the internship and will approve an application for an External Thesis, noting down any suggested courses in the host laboratories, the starting dates and the number of internships available on the website [http://www.campagnenaturalistiche.unimi.it/offerte_tesi/](http://www.campagnenaturalistiche.unimi.it/offerte_tesi/) and by informative open days organized to present the research interests of the teaching staff and application modalities. Teaching members will communicate place acceptance to students and the MBC coordinator, within the set deadlines. The internship officially starts upon submission of the appropriate form to the MCB Master’s office (via Celoria, 26 – 2nd floor, tower A).

**Caratteristiche Tirocinio**

**THE THESIS**

In order to obtain 30 CFU in the final exam, the student must acquire 12 CFU of laboratory training and present his/her Master thesis to the thesis committee. The Master thesis is a dissertation written in English and regards the research activities performed by the student during the 2nd year Internship in a research laboratory, under the guidance of a supervisor (Relatore) and a co-tutor (Correlatore). The thesis contains original data generated on the given research subject belonging to the principal disciplines of the MBC Master course. The internship lasts about one solar year (including 12 CFU of laboratory training) and normally starts in the summer of the first year. Compilation theses are by no means allowed. Master Theses are internal and external. Internal Experimental Theses are carried out at the DBS or in other Departments of the University, to which the BMC teaching staff belong.

External Experimental Theses are carried out in other Departments of the University, or in other public Institutions with adequate facilities. Authorization to perform an external Thesis is given by the Teaching Board, after careful evaluation of the proposed thesis subject and of the quality of the proponent laboratory. To place an application for an External Thesis the student must follow the rules indicated at [http://www.ccdbiol.unimi.it](http://www.ccdbiol.unimi.it) (procedure per l’attivazione di stage esterno). The application must be submitted well in advance, as it requires the approval of the Teaching Board. The Supervisor of an external thesis must be a member of the Teaching Board of Biological Sciences of the DBS.

It is also possible to acquire part of the CFU by means of stages or other kinds of experiences in working environments, providing specific theoretical and technical expertise.

**How to Select an Internship and Submit a Thesis Application**

As a rule, around February of the first year and October of the second year, students will be informed of the research areas offered in the host laboratories, the starting dates and the number of internships available on the website [http://www.campagnenaturalistiche.unimi.it/offerte_tesi/](http://www.campagnenaturalistiche.unimi.it/offerte_tesi/) and by informative open days organized to present the research interests of the teaching staff and application modalities. Teaching members will communicate place acceptance to students and the MBC coordinator, within the set deadlines. The internship officially starts upon submission of the appropriate form to the MCB Master’s office (via Celoria, 26 – 2nd floor, tower A).

The MBC Coordinator will ensure that every student is assigned to a laboratory for the internship and will approve an external thesis only if internal placements are unavailable. In this case, the Coordinator will supervise the acceptance procedures of the external thesis by the thesis committee and will also assist the student to identify a Supervisor. The Supervisor must meet the student periodically and to critically evaluate his/her work progress.
The Supervisor is responsible for the quality of the experimental work performed by the student and eventually decides if
the student can present his/her thesis in the final exam. The thesis must state on the front page where the internship has been
carried out.

**ADMITTANCE TO THE FINAL EXAM**
The student is admitted to the final exam if:
1) he/she has passed the requested mandatory, sector-guided and open-choice courses and has therefore acquired the
indicated number of CFU, including the 3 CFU assigned to the advanced English knowledge and the 12 CFU of laboratory
training;
2) he/she has completed the internship, as stated by the certificate.

**Caratteristiche della prova finale**
The MBC Master Degree will be obtained by passing a final assessment, which consists of submitting and presenting a
dissertation in English on the research performed by the student during his/her internship. The work will be presented in
English and will be followed by a public debate in front of the thesis committee. The committee will evaluate the work
presented and the student’s overall performance throughout the two-year Master, before awarding a grade based on a 110-
point scale. The degree issued by the Committee is “Laurea Magistrale” (Master Degree) in Biology.

**Orario lezioni**
The first Semester starts on October 1st 2019 and ends on January 20th 2020.
The second Semester starts on March 2nd 2020 and ends on June 19th 2020
The complete timetable of the individual courses will be posted at the following address http://www.ccdbiol.unimi.it

**ESPERIENZA DI STUDIO ALL’ESTERO NELL’AMBITO DEL PERCORSO FORMATIVO**
The University of Milan supports the international mobility of its students, offering them the opportunity to spend study and
training periods abroad, a unique opportunity to enrich their curriculum in an international context.

**Cosa offre il corso di studi**
MBC students are given the opportunity to spend part of their curriculum abroad, at a University within the European Union
(EU), in the context of the Erasmus+ program of the European Commission. Students can attend courses and sit exams that
can be included in the core curriculum and/or perform their practical thesis in several European Universities localized in
North Europe, France, Germany, Ireland, Poland and Iberian Peninsula (see http://www.dbs.unimi.it(ecm/home/erasmus/studenti-in-uscita/scienze-biologiche). Most of the Northern European Universities offer courses taught in English.
The Erasmus+ call is released each year, usually in February. More information can be found at www.unimi.it
>Studenti>Sudiareall’estero> Erasmus+.
Accepted students must present a study plan that reports all the activities he/she intends to perform abroad, detailing the
corresponding CFU; the number of proposed CFUs should approximately correspond to those the student would have
achieved over the same time period in his/her university. The proposed study plan, to be carried out under the Erasmus+
program, must be coherent with the MBC course content and must be evaluated and approved by the Teaching Board. If
necessary, the Teaching Board may request the student to integrate the program of exams taken abroad. In accordance with
the rules established by the Academic Senate, following completion of the Erasmus+ program, approved exams will be
registered, possibly with the original denomination, as part of the student’s curriculum, upon the conversion of the European
Credit Transfer and Accumulation System (ECTS) into CFU.
If the student performs the experimental thesis work abroad, he/she must follow the rules outlined above (see Internship
criteria and Rules for the thesis and final exam).

**Modalità di partecipazione ai programmi di mobilità - mobilità Erasmus**
To gain access to mobility program 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 i) the proposed study abroad program of the candidate, ii) knowledge of a foreign
language, especially when this is a preferential requirement, and iii) the motivations behind the request, is performed by
specially constituted commissions.
Each year, before the expiry of the competition announcements, the University organizes 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, organizing every year intensive courses in the following languages: English, French, German and Spanish. The University in order to facilitate the organization of the stay abroad and to guide students in choosing their destination offers a specific support service.

For assistance please contact:
International Mobility Office
Via Festa del Perdono, 7 (first floor)
Phone: (+39) 02.503 13501-13502-13495-12589
e-mail: mobility.out@unimi.it
international.education@unimi.it

MODALITA’ DI ACCESSO: 1° ANNO LIBERO CON VALUTAZIONE DEI REQUISITI DI ACCESSO

Informazioni e modalità organizzative per immatricolazione

APPLICATION FORM
Both Italian and foreign students must submit admission applications by the deadlines indicated in the “student area” of the University web portal. Undergraduates who intend to graduate by December 2019 may also apply. Completion of the application form is compulsory and must be submitted electronically to the following address: http://www.unimi.it/studenti/servizi_online.htm

BACKGROUND KNOWLEDGE
The prerequisite to access the MBC Master Degree program is an adequate knowledge of the fundamentals of biological disciplines. This will be verified through 1) evaluation of the bachelor study program and 2) direct assessment of candidate scientific background knowledge. The candidate’s background knowledge in Biology will be verified by an interview with the Commission for Admittance to the Master, composed by teaching members appointed by the Teaching Board. The interview will evaluate the expertise of the candidate in topics related to the MBC degree, and will ascertain the knowledge of the English language.

The committee evaluates the candidate on a 100-point scale:
- up to 25/100 will be given for the graduation grade;
- up to 10/100 for the curriculum (type of degree, outnumbered free courses, Erasmus experience, others…)
- up to 65/100 for the interview
The minimum requirement for admission is 60/100. As a possible outcome, despite meeting the requested curricular requirements, the candidate may be refused admission; such an outcome will prevent admission for the current year.

For the Academic Year 2019-2020, applicant interviews for those who submit their application within the set deadline (see above, “Application Form”), will take place at the Department of Biosciences, Via Celoria 26, room 2A, on the following days:
- September 25th 2019 at 14.30, for graduated students;
- November 7th 2019, at 14.30, for students that graduate in September and October;
- January 16th 2020, at 14.30, for students that graduate in December. Students must bring an ID card.

For foreign students who are not resident in Italy and were awarded their bachelor degree abroad, evaluation will be performed, based on the candidate curriculum and students may be invited to an online interview. Foreign students who reside in Italy are classed as Italian citizens and must sit the same exams. It is advisable to check for any possible updates about exam dates and times on the website: http://www.ccdbiol.unimi.it

Istruzioni operative

MBC COURSE ENROLLMENT
Only graduates who have successfully passed the entrance exam can be enrolled in the MBC course.
Registration will open 5 working days after the interview, according to the terms and conditions indicated at http://www.unimi.it/studenti/matricole/77670.htm

Students from the Università degli Studi di Milano that have acquired extra-numerary CFU during their LT course by passing MBC exams, can ask for those credit to be recognised among the 120 CFU required for MBC graduation.

Students from other Universities, upon graduation, must present certification of the awarded degree at the Segreteria Studenti.

N° posti riservati a studenti extracomunitari non soggiornanti in Italia

25

1° ANNO DI CORSO Attività formative obbligatorie

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<th>Cfu</th>
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<td>1° semestre English proficiency B2 (3 ECTS)</td>
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<td>1° semestre Molecular bioinformatics</td>
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<tr>
<td>1° semestre Organic chemistry applied to biology</td>
<td>6</td>
<td>CHIM/06</td>
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<td>2° semestre Molecular genetics</td>
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2° ANNO DI CORSO Attività formative obbligatorie

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<th>Settore</th>
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<td></td>
<td>Totale CFU obbligatori</td>
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Altre attività a scelta

The student must choose one of the following three courses:

1 semestre
- Developmental biology and genetics 6 BIO/18
- Functional genomics 6 BIO/11, BIO/18
- Molecular microbiology and genetics of microorganisms 6 BIO/19, BIO/18

1 semestre
- Biomembranes 6 BIO/09
- Molecular pharmacology and immunology 6 MED/04, BIO/14

2 semestre
- Stem cells and genetic diseases 6 BIO/14

The student must choose one of the following three courses:

1 semestre
- Synthetic biology 6 BIO/11, BIO/10, BIO/19, BIO/18, BIO/04

2 semestre
- Methods in biochemical investigation 6 BIO/10
- Signal transduction 6 BIO/10, BIO/04

The student must acquire 12 CFU by selecting any of the courses offered by the University of Milan, provided that they are coherent with MBC topics and that the course content does not overlap with those present in mandatory and guided-choice courses. Obviously, as open choice courses, the student can pick the remaining guided-choice courses that he/she had not inserted in the study plan. If unavailable in English, open-choice courses can be taken in Italian.

Attività conclusive

<table>
<thead>
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<th>Activity</th>
<th>Cfu</th>
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<tr>
<td>Final dissertation</td>
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</tr>
<tr>
<td>Totale CFU obbligatori</td>
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</tr>
</tbody>
</table>

PROPEDEUTICITA'

There are no propaedeutic courses in the MBC program that limit progression from the first to the second year.

RICONOSCIMENTI E VECCHI ORDINAMENTI

Riconoscimenti crediti già acquisiti

CFU ACQUIRED IN OTHER MASTER’S

Students requesting a transfer from another Master Degree program to MBC, will undergo the audit of an ad hoc committee that will decide if and how many of the CFU previously acquired by the student can be validated upon admittance to MBC. In addition, the Teaching Board can decide to test the background knowledge of the candidate by interview, or to request additional exams.

CFU ACQUIRED DURING PROFESSIONAL EXPERIENCES

A maximum of 9 (supernumerary) CFU can be acquired (according to art. 5, comma 7, del DM 270/2004) by certified professional experiences and by post-secondary level educational activities performed in association with the University, only after approval by the course coordinator.