Università degli Studi di Genova

School of Mathematics, Physics, and Natural Science

Teaching regulation – General part

Master degree in

Advanced Materials Science and Technology -11967
(intake 2025/2026)

Description of the operations of the MSc degree course

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Art. 1 Introduction and competence

This Regulation, in accordance with the Statute and the University Didactic Regulations, governs the organizational aspects of the teaching activities of the Master's Degree Course in Advanced Materials Science and Technology (hereinafter abbreviated as AMST for simplicity), as well as any other matters assigned to it by other legislative and regulatory sources.

The Didactic Regulation of the Master's Degree Course in Advanced Materials Science and Technology, pursuant to Art. 25, paragraph 1, of the University Didactic Regulations, is deliberated, by majority of the members, by the competent teaching structure (currently CCS in Materials Science) and submitted for approval to the relevant Departments, after consulting the School of MFN Sciences, in accordance with the current educational regulations

Art. 2 Admission requirements and methods of verifying individual preparation

To enrol in the Master's Degree in AMST, it is necessary to demonstrate possession of the following curricular requirements:

- hold a degree in one of the following classes: L-Sc.Mat class of degrees in Materials Science; L-27 Class of degrees in Chemical Sciences and Technologies; L-30 Class of degrees in Physical Sciences and Technologies; L-9 Class of degrees in Industrial Engineering
- or possess at least 70 CFU in the following sectors: FIS/X (X=01-03,07), CHIM/X (X=01-04,06-07,12), ICAR/08, ING-IND/X (X=06,09-14,16,21-25,27,31), ING-INF/X (X=01-02,06-07), MAT/X (X=02-03,05-08)

To access, the student must have a knowledge of the English language at least at level B2 of the European framework of reference. The knowledge of the English language at level B2 or higher is verified through certification in possession of the candidates, or, in the absence of it, through passing the B2 test provided by the Language Skills Development Sector of the University of Genoa. The requirement of language knowledge is also considered satisfied if the candidates have a degree in English, to be certified through an official document or letter from the university that issued the degree, showing that the study path was entirely conducted in English. If none of the previous conditions are met, the language knowledge must be verified during the personal preparation test by the admission commission.

To be admitted, it will also be necessary to have an adequate individual preparation, as required by law (Art. 6, paragraph 2 of DM 270/04)

Those who intend to apply for admission must submit the required documentation in the forms, times, and methods established by the School of MFN Sciences and made known through the Degree program in order to allow the evaluation of curricular requirements and the verification of adequate preparation.

The admission procedures are different for the ordinary curriculum and for the international curriculum.

- ORDINARY CURRICULUM

For Italian students only, it is possible to enrol in the AMST Master's Degree with reservation, provided that the degree is obtained within the deadline established annually by the rector's decree of the University of Genoa or by the DCCI Department Council, if earlier than the university deadline. Enrolment with reservation is allowed only

for students who, within 15 days from the start of classes, have already acquired all the university credits (CFU) required by their study plan (excluding any extra-curricular credits) except for a maximum of 18 CFU of teachings. The final exam and the internship, and all activities classified as "other" are excluded for the calculation of the 18 CFU. However, it is necessary that the internship activity, if not yet completed, does not preclude attendance at the teachings. Admission applications from non-European students living abroad must be submitted through the appropriate university website https://unige.it/en/internazionale/procedura-prevalutazione-lauree-magistrali-inglese-solo-studenti-non-eu-residenti-all

ADMISSION APPLICATION

Those who intend to apply for admission must:

1. submit a pre-enrollment application according to the Unige online procedure.
2. submit an online admission application by a date specified in the Degree program (usually in October), in which they self-certify the possession of the admission requirements

CURRICULAR REQUIREMENTS

In the case of Italian degrees obtained with regulations that do not provide credits, or degrees obtained abroad, the CCS will assign each acquired training activity a scientific-disciplinary sector and a value in CFU. Credits may also have been obtained through attendance at multiple Study Courses or by enrolling in individual teachings. These curricular requirements are automatically satisfied by degrees obtained at the University of Genoa in the following classes: • Materials Science, class 25 - Physical Sciences and Technologies (former DM 509/99); • Materials Science, class L-30 - Physical Sciences and Technologies (former DM 270/04); L-27 Chemical Sciences and Technologies, L-9 Industrial Engineering. Graduates in Italy in the class of Materials Science established by DM 146 of 9/2/21 automatically meet the curricular requirements. Graduates in the classes of degrees in Physical Sciences and Technologies, Chemical Sciences and Technologies, Industrial Engineering have curricula that generally meet the minimum requirements, but verification will be carried out on a case-by-case basis. If the candidate does not meet the specific curricular requirements, they may enrol in individual training activities aimed at admission to the Master's Degree Course. Candidates in this condition will be contacted by the Admission Commission to the LM

VERIFICATION OF THE INDIVIDUAL PREPARATION

All applications that meet the above curricular requirements will be examined for the verification of individual preparation. Italian students with a final bachelor's degree grade lower than 90/110 and all students with an admission qualification obtained abroad must pass a verification test, in the form of a public interview or video interview in remote. The test will take place in the presence of an examination commission consisting of at least two members of the Commission for Admissions to the Master's Degree. In other cases, the verification of the adequacy of individual preparation will be carried out by a specially appointed Commission, which will take into

account: - previous curriculum vitae et studiorum; - grades obtained in exams of interest disciplines (see curricular requirements); - any oral test that will focus on basic knowledge in mathematical, physical, chemical, and technological disciplines that can typically be acquired with a first-level scientific-technological degree.

The verification will be carried out on dates agreed with the candidates through email exchange with the Coordinator. If not passed, it can be retaken only once at least 30 days after the first verification

- INTERNATIONAL CURRICULUM (Serp+: https://www.master-serp.eu/apply/admission-criteria)

ADMISSION

Admission to the international SERP+ curriculum is regulated by specific rules subject to a Consortium Agreement ratified by the Rectors of the four involved institutions. All the rules provided in the Consortium Agreement related to the Master's Degree Course in Materials Science and Engineering apply to this Study Course.

The Master's program is open to excellent European and non-European students. The main criterion for admission is to have a degree in chemistry, physics with elements of chemistry, or Materials Science or Engineering, which corresponds to 180 CFU. Additionally, the candidate must demonstrate a good knowledge of written and spoken English at least at level B2 (demonstrated through possession of TOEFL or IELTS or Cambridge certificates). The selection of applications will be carried out by a specific international commission.

To encourage lifelong learning, applications to follow the entire program from candidates with professional experience will also be considered.

The selection of all candidates will take place according to the criteria and weights mentioned below:

• 50%: results achieved in academic (and professional if applicable) exams with evaluation of workloads (CFU), adequacy of the curriculum, grades achieved)

• 20%: reference letter

• 10%: English

• 10%: motivation letter

• 10%: involvement in associations, networks, or other extracurricular activities that show leadership skills and dynamic character.

The information regarding the application and selection procedure will be communicated to candidates through the SERP+ website (http://www.master-serp.eu). An email address (master.serp@u-psud.fr) will also be available for candidates who wish to ask questions about the admission procedure. The latter will take place through an online application with the possibility for candidates to upload their documents and follow the status of their application. Future students will need to submit the following documents:

- copy of the passport
- Curriculum Vitae
- personal motivation statement
- copy of the highest degree obtained
- copy of the Degree Certificate with the transcript of records and the related grade obtained, along with an explanation of the grading system in place at the home university
- proof of English language proficiency
- reference letter and contact information of a referee

VERIFICATION OF THE POSSESSION OF ADMISSION REQUIREMENTS

The possession of the admission requirements of the students will be jointly verified by the international judging commission composed of at least one professor from each partner institution. The commissioners will have online access to the candidates' files and will be able to give their evaluation online using the appropriate common platform prepared for this purpose. Each application will be examined by at least two commissioners from different partner institutions. The results will be recorded on the platform and discussed in a meeting where the final decision will be made. The commission draws up a list of selected students and a reserve list. The judging commission will ensure that gender balance is respected and that no group of European Union citizens or third-country nationals is excluded or disadvantaged. The results of the procedure will be promptly reported to the candidates via email.

Admitted students must register at the universities where they will attend the various semesters (from the first to the third, the fourth being dedicated to the thesis). Only these institutions will issue them the diploma. Students must attend semesters in at least two universities of the consortium. The documents necessary for registration are listed on the SERP+ website and will be sent by email to the students before the start of the semester. The payment of tuition fees must be made before registration.

Art. 3 – Educational activities

The Master's Degree Course lasts two years, during which the student must acquire 120 educational credits (CFU). In addition to the requirements of the LM-Sci Mat class, the Master's Degree Course in Advanced Materials Science and Technology has specific educational objectives listed in the Didactic Regulations of the Master's Degree Course. Annex 1 provides the general framework of the educational activities (ref. Didactic Regulations of the master's degree Course) and the framework of the activities provided by this Regulation; the attached excel table lists the educational activities of the first and second year, with specific educational objectives, educational credits, hours of assisted teaching, and hours of individual study.

1. The types of educational activities that allows the acquisition of credits are as follows:

- Courses, possibly divided into modules, which may include, depending on the case:
- Lectures in the classroom, exercises in the classroom, exercises and practical activities in teaching laboratories and research laboratories, specialized seminars, guided tours of companies; (72 total CFU of courses, of which 12 CFU are free choice for the ordinary curriculum and 9 for the international curriculum);
- 3 CFU for the study of a European Union language other than the mother language.

- Other activities (3 total CFU) that may include activities useful for entering the world of work such as internships at companies or laboratories (external or internal to the university) aimed at acquiring experimental methods and professional skills; data processing activities and use of advanced technologies.
- Activities related to the Thesis and the preparation of the final exam (30 CFU).

All courses are in English.

The courses of the International SERP+ Curriculum will be activated only if this curriculum is activated.

2. Each educational credit corresponds to 25 hours of total student work for the acquisition of the related skills.

Depending on the type of activity, there is a different ratio between hours of assisted teaching and personal study by the student. In particular, 1 CFU normally corresponds to:

- 8 hours of frontal lesson + 17 hours of personal study (portion reserved for individual study 68%)
- 10 hours of classroom exercise + 15 hours of personal study (portion reserved for individual study 60%).
- 12-13 hours of practical laboratory activity + 13-12 hours of personal study (portion reserved for individual study 52%).
- the thesis activity involves student work up to 25 hours per credit, carried out under the supervision of a supervisor.
- 12-13 hours of other activities + 13-12 hours of personal study (portion reserved for individual study 52%); the portion of the total hourly commitment reserved for personal study can never be less than 50%, except for activities with a strong practical content.

For the teachings of the international curriculum delivered abroad, the number of hours of lessons, exercises, and laboratory activities are determined by the respective locations in accordance with the regulations in force there

Art. 4 – Enrolment in individual educational activities

In accordance with Article 5 of the University Regulations for students, to enrol in individual educational activities, it is necessary to have a qualification that allows access to the University. Considering the characteristics of the theoretical-practical didactic organization, applications for enrolment in individual educational activities related to the Degree Course can only be accepted after evaluation by the CCS necessary for the proper conduct of the courses themselves

Art. 5 – Curriculum

For the Master's Degree Course in AMST, two curricula are provided: the ordinary curriculum in English and the international curriculum, also in English, with structured international mobility called SERP+.

Students of the international curriculum are subject to special admission and retention conditions, regulated by the Consortium Agreement (and related annexes) signed by the Rectors of the involved institutions.

The Degree Course provides two professional profiles:

Material Scientist: Research Specialist that involves acquiring knowledge and skills useful for understanding the correlation between the chemical, physical, and mechanical properties of materials and their structure on a molecular and micrometric scale, with particular reference to their advanced applications (such as materials for renewable energy, materials for sustainable chemistry, two-dimensional and nanostructured materials). Knowledge and skills in simulation techniques, methods, and instrumentation for the synthesis and characterization of the chemical, physical, and technological properties of materials. Skills in the development of measurement apparatus designed ad hoc.

Material Scientist: Technology Specialist that involves acquiring knowledge and skills useful for understanding the correlation between the chemical, physical, and mechanical properties of materials and their structure, with particular reference to their industrial applications (such as production processes and quality control methods of materials, devices for specific applications). Knowledge of the application aspects of materials such as metallic, polymeric, superconducting, and functional materials of various kinds. Knowledge and skills in simulation techniques, methods, and instrumentation for the synthesis and characterization of the chemical, physical, and technological properties of materials

The teaching syllabus specify for optional teachings the profile(s) for which the teaching is indicated

Art. 6 –Total time commitment

The definition of the hourly fraction dedicated to lessons or equivalent educational activities is established, for each teaching, by the CCS with hourly correspondence defined in Article 3. The Director of the DCCI Department and the CCS Coordinator are responsible for verifying compliance with the aforementioned provisions, also for the purpose of publishing the teaching programs

Art. 7 – Study Program and prerequisites

All students are required to submit an annual Study Program indicating all the educational activities of the year, within the deadlines indicated by the reference School and specified in the Degree program.

Free-choice teachings that do not have at least three students enrolled are not activated. In special cases, exceptions may be allowed in agreement with the Course Coordinator and the Director of the DCCI. To allow effective planning of educational activities, students are invited to declare in advance the optional and free-choice teachings they intend to include in the Study Plan within the deadlines specified in the Degree program and in any case by August. The modification of this indication is allowed at the time of submission of the Study program, except in cases where it leads to the non-activation of a teaching

The student who, in formulating their study program, follows the framework provided by this Regulation as well as the indications provided by the Degree program, presents a plan for automatic approval, except for free choices for which the CCS will evaluate the coherence with the educational objectives of the Master's Degree Course

In accordance with current regulations, the student can submit an individual Study program, containing educational activities different from those provided by the Didactic Regulation, provided they are consistent with the educational regulations of the Course of Study of the year of enrolment

Study plans are approved by the Study Course Council. Study plans that do not consistent to the curricula included in the ministerial database of the educational offer, but are consistent with the educational regulations or articulated over a shorter duration than normal, must be approved by both the CCS and the Council of the reference Department.

Students are invited to take the exams of the various teachings following any indications on prerequisites provided along with the programs of each teaching in the Degree program.

Finally, the thesis activity cannot be started if at least 54 credits for educational activities related to teachings have not already been acquired.

Students enrolled in the international curriculum (SERP+) must attend the lessons of the first, second, and third semesters in at least two different countries of their choice:

FIRST YEAR

• **Semester 1**: conducted in France on “Fundamentals and methods for chemistry and physical chemistry” (28 CFU) in English Fundamentals and methods.

At the end of the first semester, a winter school will be held in Portugal or Poland in alternate years on 'Data Science' (2 CFU). These CFUs are provided by the University of Paris Saclay

• **Semestre 2**: potrà essere svolto in Polonia oppure in Portogallo (25 CFU):

Polonia:

Physical Chemistry and photochemistry of molecules and biomolecules

Portogallo:

Chemistry and physics of materials and interfaces for sustainability

Semester 2: can be carried out in Poland or Portugal (25 CFU):

- Poland: Physical Chemistry and photochemistry of molecules and biomolecules
- Portugal: Chemistry and physics of materials and interfaces for sustainability

At the end of the second semester, a summer school will be held with the aim of developing students' entrepreneurial skills. The school focuses on: communication, project management, economic management, NTIC (ICT), European patent law, venture capital and financing, technological enhancement, and finally on the preparation of a professional project. The school will be held in Genoa, but the CFU will be provided by Portugal or Poland depending on the student's mobility.

SECOND YEAR:

- **Semester 3** can be carried out at Paris Saclay in France (30 ECTS), at Unige in Italy (30 ECTS), or at McGill University in Montreal, Canada (60 ECTS). If students study in Canada, they must stay there for the entire second year.
  In France, the specialization is: Nanomaterials for medicine and energy: from research to decision making.
  In Italy: Nanostructuring at surfaces for energy harvesting, electronics, and green chemistry.
  In Canada: Intensive Research path in physical chemistry and related fields.

  The titles and contents of the courses offered for each semester can be found at the link: (https://www.master-serp.eu/)

- **Semester 4:** dedicated to 6 months of internship/thesis (related to the preparation of the final exam, 30 CFU).

During the third semester, the student must propose 3 possible thesis topics with the names of potential supervisors and the laboratories where these activities will be carried out, in line with the educational objectives. If the student proposes to carry out the internship in a university laboratory, it must be hosted by one of the partner institutions or associated partner institutions. The student must propose a co-supervisor, professor, or industrialist, residing in their home country, if possible, active in a field related to the chosen internship topic. The co-supervisor will be invited to participate in the evaluation of the written report.

The study plan jointly approved by the institutions (https://www.master-serp.eu/) is automatically recognized and approved by the CCS. The study plan depends on the institutions the student will attend during their educational path.

The replacement of mandatory teachings of the ordinary curriculum with teachings of the international curriculum is not allowed, except for the right to present individual study plans that will be examined on a case-by-case basis by the competent bodies

Art. 8 – Attendance and methods of conducting educational activities

The educational activities of each year are carried out in two teaching periods (conventionally called semesters), with a suitable break (at least four weeks) at the end of the first period, for the conduct of exams and other assessment tests.
Other teaching activities are carried out based on the specific availability of the structures involved and the student's career, usually around the end of the first semester of the second year. The activity related to the preparation of the final exam is usually carried out (mandatory for the international curriculum) in the second semester of the second year.

The calendar of activities proposed for each academic year is contained in the Degree program.

The class schedule is published annually before the start of the courses.

Attendance at all educational activities is strongly recommended for students of the ordinary curriculum and mandatory for those of the international SERP+ curriculum. Attendance at laboratory activities is also mandatory for working students, students with disabilities, and students with specific learning disorders (SLD); however, personalized schedules may be provided for these students, subject to the availability of teaching resources, facilities, and equipment. The CCS will provide the necessary aids for students with disabilities to acquire practical training equivalent to that of all other students. Attendance is also required for internship activities, which must be certified by the supervisor.

Art. 9 – Exams and other profit assessments

1. For each training activity indicated in the annex, an individual final assessment is provided, during the periods scheduled for exam sessions, on dates established by the Degree Course Council based on proposals made by the responsible teachers or agreed with them and in accordance with the University Didactic Regulations

Exames may be scheduled during the lesson period only for students who, in the current academic year, have not included training activities in their study plan.

In the case of intermediate tests, with the passing of the final assessment, the student acquires the CFU attributed to the training activity.

For internships or other activities, a report on the activity carried out, countersigned by the tutor of the structure or the responsible teacher, is required.

2. For the training activities related to teachings, the final assessment referred to paragraph 1, in addition to the acquisition of the related CFU, involves the assignment of a grade expressed in thirtieths with possible laude. The exam is passed by those who achieve a score of at least 18 thirtieths. For other activities, except those related to the final exam, the evaluation is expressed with an assessment of suitability. For internships and other activities not related to teachings, the task of verifying the passing of the test is entrusted by the CCS to the Coordinator (or their delegate) after consulting the responsible parties for the activities themselves. Students with disabilities and students with specific learning disorders (SLD), upon explicit request made through the School's representatives for students with disabilities and SLD, are allowed equivalent tests and longer times for written tests. Students with disabilities take exams with the use of the necessary aids and, if necessary, with the presence of assistants, verified and approved by the University, for autonomy and/or communication in relation to the degree and type of their disability.

Information on the methods of carrying out other activities will be made available on the CCS website.

3. The number of exams or final profit assessments required for the achievement of the degree cannot exceed 12 (except in the case of the international curriculum). For the purpose of the count, the characterizing, related and integrative, and elective training activities must be considered (the latter counted collectively as a single exam)

4. The final assessments may consist of: oral exam, written exame, written or oral report on the activity carried out, test with open-ended or multiple-choice questions, practical laboratory or computer test. The methods of the final assessment, which may include more than one of the forms indicated above, are indicated annually by the teacher responsible for the training activity and approved by the CCS before the start of the teaching activities. During each academic year, at least five exam sessions must be scheduled for courses that include written or laboratory tests and at least seven exam sessions for those that include only oral tests. The interval between two successive exam sessions must be at least thirteen days. Exam sessions may be scheduled during the lesson period only for students who have met all the attendance obligations required by their study plan or who are enrolled part-time.

For the international curriculum, the exam sessions are held in a manner compatible with the change of location, regulated by the consortium.

5. The exam commissions are composed of at least two members, one of whom is the teacher responsible for the teaching. Members of the commission may include experts in the subject identified by the CCS based on criteria that ensure they possess scientific, educational, or professional qualifications.

If the exam covers multiple teaching or a teaching is divided into two modules, the teachers responsible for those must be part of the commission. International curriculum students must obtain all the credits required by their annual study plan by the summer session.

Students who do not achieve this goal may request admission to the ordinary curriculum. The CCS will decide on the recognitions and modifications of the study plan to allow the achievement of the Italian title in such cases

Art. 10 – Recognition of credits – Obsolescence of credits

- *Recognition of credits*

Europe	**E=Sufficient**			D=Satisfactory			**C=Good**			**B=Very Good**			**A=Excellent**	
Italy	18	19	20	21	22	23	24	25	26	27	28	29	30	30 e lode
Austria	4			3			2			1				
Belgium	11			12			13	14		15	16	17	18	19-20
Denmark	02			4			7			10			12	
Finland	1						2			3		4		5
France	10-10.49	10.50-10.74	10.75-10.99	11.00-11.49	11.50-11.74	11.75-11.99	12-12.99	13.00-13.49	13.50-13.99	14.00-14.99	15.00-15-49	15.50-15.99	16	17-20
Germany	4.0		3.7		3.3		3.0		2.7	2.3	2.0	1.7	1.3	1.0
Greece	5	6		7			8			9			9.5	10
Irland	40	42	44	46	48	50	52	55	58	61	64	67	70	71-100
Island	5			6			7			8			9-10	
Lithuania/Latvia	4			5			6			7		8		9-10
Luxembourg	30	31	32	33	34	35	36	37	38-39	40-49				
Malta	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80	81-84	85-88	89-92	93-96	97-100
Norway	2						3			4		5		6
Netherlands	5.5	6		6.5		7		7.5		8		8.5	9	10
Poland	3			3+			4			4+			5	
Portugal	10	11		12	13		14	15		16	17		18	19-20
UK	40-50	51	52	53-55	56-58	59-61	62-63	64-65	66-69	70-73	74-76	77-80	80-90	90-100
Spain	5	5,1 – 5,2	5,3-5,6	5,7 – 6,0	6,1 -6,3	6,4-6,6	6,7-7,0	7,1 -7,3	7,4-7,6	7,7-8,0	8,1-8,3	8,4-8,6	8,7-9,0	9,1-10
Sweden	G	G+		G++			Val G			Val G+				MVG
Swiss	4			4.5			5			5.5			6	

The recognition of credits obtained in other study courses is carried out following specific resolutions of the CCS: in the case of students coming from Study Courses of the same class, the CCS will maximize the recognition, in accordance with the Didactic Regulations, of the CFU obtained in the corresponding SSD acquired by the student in the previous educational path; in the case of students coming from courses of a different class, the CCS will evaluate the congruence of the disciplinary sectors and the contents of the courses in which the student has earned the credits. Following the recognition, the student will be assisted in compiling the study plan by the didactic commission

Exclusively in the case where the transfer of the student is carried out between master's degree courses belonging to the same class, the share of credits related to the same scientific-disciplinary sector directly recognized to the student cannot be less than 50% of those already obtained. In the case where the course of origin is conducted in distance learning mode, the minimum share of 50% is recognized only if the course of origin is accredited pursuant to Legislative Decree 27 January 2012, n. 19.

As regards the recognition of professional knowledge and skills or training activities not corresponding to teachings (DM 931 01/07/2024), and for which there is no reference to a disciplinary sector, the CCS will evaluate on a case-by-case basis the content of the training activities and professional knowledge and skills, and their consistency with the course objectives, within the overall maximum limit of 24 CFU. The types provided for these activities are: - up to a maximum of 8 CFU other activities: professional activities (work at companies or institutions), active participation in seminars or schools on topics related to Materials Science and Technology; certifications of specialist-level IT skills; up to a maximum of 6 CFU of certified language skills - up to a maximum of 24 CFU: activities related to elective courses.

- Obsolescence of credits

The credits acquired within the Degree Course are valid for ten years.

After the indicated period, the acquired credits must be validated with a specific approval if the CCS recognizes the non-obsolescence of the related educational content.

If the CCS recognizes the obsolescence of even a part of the related educational content, the same CCS establishes the supplementary tests that the student must take, defining the topics and the verification methods.

Art. 11 - Mobility, studies abroad, international exchanges

Students admitted to undertake a temporary period of study at another university, based on programs or projects recognized by the University, must obtain prior approval from the CCS regarding the recognition of the credits they intend to acquire at that university. At the end of the period spent away, based on the certification presented, the CCS will decide to recognize the educational activities carried out, the related credits, and the profit evaluations, referring them to the scientific-disciplinary sectors of the Master's Degree Course and converting them, if necessary, into the adopted credit system. In case there is no precise correspondence with the individual educational activities provided, but there is a real congruence with the curriculum, an individual study plan may be adopted.

The student who intends to use student mobility programs abroad must submit a study plan indicating the courses and educational activities they will follow at the host university. This study plan, which will be evaluated by analysing the educational coherence of the entire study path abroad with respect to the educational objectives of

the Master's Degree Course, must be approved in advance by the CCS. At the end of the mobility period, the credits acquired in accordance with the study plan can be recorded without the need for further CCS resolutions.

For countries not included, the correspondence in thirtieths will be indicated by the CCS Coordinator, in consultation with the Erasmus Representatives of the School and the CCS. The CCS has initiated specific actions to improve the levels of internationalization of the educational path, also through the structured inclusion within the study plans of study paths abroad: the possibility of carrying out the thesis abroad, the presence of the international SERP+ curriculum, the possibility of carrying out educational activities in English in the ordinary curriculum, the incentive to spend semesters in mobility programs (see art. 10 determination of the graduation grade) are examples of such actions.

Art. 12. Final exam procedures

For admission to the final exam, the student must have obtained all the other credits required by the academic regulations of the Master's Degree Course

The thesis activity, in preparation for the final exam, consists of an original work by the student on a topic in Materials Science and Technology carried out under the guidance and responsibility of a supervisor; the thesis work is presented in a written paper that reports the results and must be delivered at least 15 days before the graduation exam. The report can be written in Italian or English for the ordinary curriculum. It is mandatory to write it in English for the international curriculum.

The Graduation Commission, with the presence of the supervisor and co-supervisor, examines the candidate in a pre-graduation exam, assigning a score to the thesis work and the written paper. In case of impossibility to be present, the supervisor and/or co-supervisor send a written report to the President of the Graduation Commission.

During the graduation session, the candidate briefly presents their work (15 min) and the graduation commission assigns the graduation grade.

The final exam is public and consists of the presentation of the topic of the activity carried out and the discussion of the results achieved in front of a commission composed of at least 5 members, including the President, as established by the University Didactic Regulations. The Commission is appointed by the Director of the relevant Department. Specific procedures for conducting the final exam, in application of conventions for the issuance of a double degree or joint degree, are regulated separately.

The graduation score is expressed in 110 and includes an overall evaluation of the student's curriculum, the thesis, and its presentation and discussion during the final exam. The grade is determined as follows. The weighted average for the number of credits of the grades in thirtieths assigned during the evaluation of the various training activities, including the thesis work, is calculated. The grade for this work is assigned by the Graduation Commission for the ordinary curriculum and by the SERP+ final exam commission for the international curriculum

To this weighted average, converted into one hundred and tenths, an increment of up to a maximum of eight points is added, determined as follows:

- Evaluation of the Degree Exam (decided by the graduation commission for the ordinary curriculum, deducted from the grade of the Paris commission for the international SERP+ curriculum): up to a maximum of 3 points
- Presence of laude in the curriculum studiorum: up to a maximum of 1 point

- Number of semesters spent abroad by the student in Erasmus or in recognized international training activities: (from 0 to 1 point for each semester, in relation to the acquired CFU): up to a maximum of 3 points
- Time taken to obtain the degree: up to a maximum of 1 point
- Participation in institutional commissions (CCS, Department, School, University): up to 1 point
- External internship (6 CFU of other activities, if not already evaluated as an activity related to the Thesis): up to 0.5 points

Students who exceed the score of 110 may be awarded cum laude with the unanimous vote of the Commission.

The evaluation of the thesis and the final exam takes into account the learning outcomes in terms of: knowledge and understanding of the topic, ability to apply the acquired knowledge, ability to make independent judgments, ability to communicate concisely and comprehensively in written and oral form, ability to independently find new sources of information and directly learn their contents by relating them to the context of their own knowledge, ability to integrate into a work environment (inside or outside the university).

Students of the international SERP+ curriculum must pass the final exam by the summer session. This exam is taken at the University of Paris Sud, the lead institution of the Master's program, according to the rules established by the consortium agreement signed by the Rectors of the involved institutions.

Art 13. Orientation and tutoring

To promote the continuity of the educational path and for integration into the world of work, the CCS has established an Orientation and Tutoring Commission, which collaborates with the school's orientation commission and other interested parties.

The same Commission will provide a tutoring service aimed at assisting students throughout their studies, to prevent dropout and delays in studies and to promote active participation in university life in all its forms.

The Orientation and Tutoring Commission is a point of reference for all students of the Course regarding orientation or other educational issues. All Professors and Researchers are required to collaborate in tutoring activities

Art. 14 Coordination activities – Credits Periodical verification

As required by the University Didactic Regulations, for the full achievement of the educational objectives of the Master's Degree Course, the CCS, respecting the freedom of teaching, coordinates the programs of the teachings and other training activities, promotes the coordination of teachers, and evaluates the results of the activities in collaboration with the School's Joint Commission. To this end, at least one annual meeting of the Council of Study Courses in Materials Science is scheduled for planning and one for evaluation.

The CCS implements initiatives for the evaluation and monitoring of the workload for students to ensure an adequate correspondence between the CFU assigned to the various training activities and the actual workload.

Every three years, the CCS, after appropriate evaluation, activates a procedure for revising the didactic regulations, with particular regard to the number of credits assigned to each training activity. The same procedure is also activated whenever at least one quarter of the members of the Council request it from the CCS Coordinator.

Art.15 Degree program

The Degree program, aimed at maximum transparency of the Teaching Offer, lists year by year the list of activatable teachings. It provides further details on admission applications, including the student's career conditions that allow the submission of the application. It indicates the deadlines for enrolment in the Master's Degree Course and for the submission of study plans, the periods for carrying out the verification tests, as per Art. 2 of this Regulation, the training activities, and the periods, not overlapping with these, for carrying out the profit exams, in compliance with the provisions of art. 26, paragraph 4 of the University Didactic Regulations.

Art. 16 CCS committees

The degree course is governed by the Council of Study Courses (CCS) in Materials Science, the same council also governs the Bachelor's Degree in Materials Science. It is chaired by a coordinator, who appoints a vice-coordinator, who remains in office until the coordinator who appointed them resigns or is dismissed. The AQ Commission of the CCS is made up of a number of teachers ranging from 4 to 6, the coordinator and the vice-coordinator, a student representative, and a representative of the technical-administrative staff of the Department of Chemistry and Industrial Chemistry or the Department of Physics, and the Teaching Representatives of the Department of Chemistry and Industrial Chemistry and the Department of Physics.

The CCS makes use of commissions as described in the appropriate section of the SUA-CdS.

Art. 17 Self-evaluation

The AQ Commission is responsible for self-assessment procedures and the drafting of related documents (SUA-CdS, Commentary on Indicators, Cyclical Review Report). The organization and responsibilities of AQ at the Study Course level are described in detail in section D2 of the SUA-CdS. Each teacher accesses the evaluation of their own teachings. The CCS Coordinator accesses the results of the questionnaires completed by students on the training activities followed. The coordinator privately convenes the teachers who have been assigned teachings or modules that have received a rating below a threshold established by the AQ commission to agree on concrete actions aimed at improving the quality of the teaching activity they carry out (or its perception). The coordinator drafts an annual report that reports the aggregated results in an anonymous form.

Art. 18 Apprenticeship training and higher education

In accordance with the agreement between the University of Genoa and the Liguria Region regarding the regulation of higher education apprenticeships (Legislative Decree 167 of 14/9/2011), if a student enrolled in the Master's Degree is hired by a company through an apprenticeship contract falling under the aforementioned agremeent, the CCS will agree with the student and the company on a personalized study plan, provided it is consistent with the educational regulations. This path may include both attendance at courses activated at the University and ad hoc training activities (formal, non-formal, or informal as defined by Article 4 of Law 92 of 28/6/2012) that take into account the professional needs of companies. Non-formal and informal activities may not exceed 12 CFU. The recipients of these personalized paths are students under the age of 30 who have, as a rule, already acquired 50 CFU. The experimental thesis and any other related activities will be carried out in these cases at the company. For each student hired through an apprenticeship contract, the CCS will appoint a tutor.

Art. 19 - Activities aimed at improving teaching and resolving any critical issues.

The CCS encourages its teachers to participate in activities promoted by GLIA. It is the responsibility of the Didactic Commission to work to improve the quality of teaching and to rationalize its organization as best as possible. The Didactic Commission, proceeding informally and quickly, examines any critical issues reported by students, members of the CCS, or resulting from the ongoing monitoring of student careers, and after consulting the interested parties, proposes any necessary actions to the Council

Art.20 - Complaints

Students may choose the following procedures for submitting formal complaints:

a) inform the CCS Coordinator directly and verbally, who will deal with the problem personally and attempt to resolve it independently.

b) inform the CCS Coordinator in writing, who will officially deal with the complaint and forward it to the CCS and possibly the Director of the Department responsible for the Master's Degree Course;

c) inform the Director of the Department.

d) contact the University Guarantor.

The complaints procedures are listed on the CCS website.

Annex 1 Special part of the teaching regulations

GENERAL overview of training activities:

According to the current Ordinance ex DM 270/2004 and subsequent amendments, the educational activities that students must acquire are divided into Characterizing, Related, Related, and Other activities.

Type of Educational Activity	**Disciplinary Area**	**Subject Areas and Related Scientific Disciplinary Sectors (SSD)**	**RAD**		**Curriculum ordinario**	**Curriculum internazionale**
			Min	**Max**		
Core Subjects	**Chemistry and Physics of Matter**	Physics Subjects (FIS/01, FIS/02, FIS/03, FIS/07)	16	24	22	16
		Chemistry Subjects (CHIM/02, CHIM/03, CHIM/04, CHIM/06)	18	24	22	20
	TOTALE		**35**	**44**	**44**	**36**
	Materials Engineering , ING-IND/21, ING-IND/22, ING-IND/23, ING-IND/27)		**11**	**18**	**12**	**12**
Related and Integrative Activities			**12**	**20**	16	18
Other Educational Activities	student's *choice*		**8**	**12**	12	9
	Final Exam		**30**	**30**	30	30
	Other Educational Activities	**Additional Language Skills**	**3**	**6**	3	6

		IT and Telematic Skills	0	5	0	2
		Training and Orientation Internships	0	5	0	5
		Other Professional Skills	0	5	3	2
Total CFU (credits)				120	120	120

Università degli Studi di Genova

Scuola di Scienze Matematiche Fisiche e Naturali

Regolamento Didattico – Parte Generale -

Corso di Laurea Magistrale

Advanced Materials Science and Technology -11967
(coorte 2025/2026)

Descrizione del funzionamento del corso di Laurea

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Art. 1 Premessa e ambito di competenza

Il presente Regolamento, in conformità allo Statuto e al Regolamento Didattico di Ateneo, disciplina gli aspetti organizzativi dell'attività didattica del Corso di Laurea Magistrale Advanced Materials Science and Technology (d'ora in poi abbreviato AMST per semplicità), nonché ogni diversa materia ad esso devoluta da altre fonti legislative e regolamentari.

Il Regolamento didattico del Corso di Laurea Magistrale in Advanced Materials Science and Technology, ai sensi dell'art. 25, comma 1, del Regolamento Didattico di Ateneo, è deliberato, a maggioranza dei componenti, dalla competente struttura didattica (attualmente CCS in Scienza dei Materiali) e sottoposto all'approvazione dei Dipartimenti interessati, sentita la Scuola di Scienze MFN, in conformità con l'ordinamento didattico vigente.

Art. 2 Requisiti di ammissione *e modalità di verifica della preparazione individuale*

Per iscriversi alla Laurea magistrale AMST è necessario dimostrare il possesso dei seguenti requisiti curriculari:
possedere una laurea in una delle seguenti classi: L-Sc.Mat classe delle lauree in Scienza dei materiali; L-27 Classe delle lauree in Scienze e tecnologie chimiche; L-30 Classe delle lauree in Scienze e Tecnologie Fisiche; L-9 Classe delle lauree in ingegneria industriale

oppure possedere almeno 70 CFU nei seguenti settori:
FIS/X (X=01-03,07), CHIM/X (X=01-04,06-07,12), ICAR/08, ING-IND/X (X=06,09-14,16,21-25,27,31), ING-INF/X (X=01-02,06-07), MAT/X (X=02-03,05-08);

Per accedere lo studente deve possedere una conoscenza della lingua inglese almeno al livello B2 del quadro europeo di riferimento. La conoscenza della lingua inglese pari al livello B2 o superiore è verificata tramite certificazione in possesso dei candidati, o, in assenza di essa, tramite superamento del test B2 erogato dal Settore Sviluppo Competenze Linguistiche dell'Università di Genova. Il requisito della conoscenza linguistica è ritenuto altresì soddisfatto se i candidati sono in possesso di un titolo di laurea in lingua inglese, da certificarsi tramite documento ufficiale o lettera dell'università che ha erogato tale titolo, da cui si evinca che il percorso di studi si è svolto interamente in lingua inglese. Se nessuna delle precedenti condizioni è soddisfatta, la conoscenza linguistica deve essere appurata durante la prova di verifica della preparazione personale da parte della commissione di ammissione.

Per essere ammessi, sarà inoltre necessario possedere una adeguata preparazione individuale, come richiesto dalla legge (Art. 6, comma 2 del DM 270/04).

Coloro che intendono richiedere l'ammissione devono inviare la documentazione richiesta nelle forme, nei tempi e nei modi stabiliti dalla Scuola di Scienze MFN e resi noti con il Manifesto degli Studi al fine di permettere la valutazione dei requisiti curriculari e la verifica dell'adeguata preparazione.

Le modalità di ammissione sono diversificate per il curriculum ordinario e per quello internazionale.

- CURRICULUM ORDINARIO

Per i soli studenti italiani è possibile l'iscrizione alla laurea Magistrale AMST- con riserva, purché la laurea sia conseguita entro il termine stabilito annualmente con decreto rettorale dell'Università di Genova o dal Consiglio di dipartimento del DCCI, se anticipato rispetto a quello di ateneo. Sono ammessi all'iscrizione con riserva solo gli studenti che, entro 15 giorni dall'inizio delle lezioni abbiano già acquisito tutti i crediti formativi universitari (CFU) previsti dal loro piano di studio (con esclusione degli eventuali crediti extra-curricolari) tranne al più 18 CFU di insegnamenti. La prova finale ed il Tirocinio, e tutte le attività classificate come "altre" sono escluse ai fini del calcolo dei 18 CFU. È necessario, tuttavia, che l'attività di tirocinio, qualora non sia ancora completata, non precluda la frequenza degli insegnamenti. Le domande di ammissione degli studenti non europei che vivono all'estero devono essere presentate tramite l'opportuno sito di ateneo https://unige.it/en/internazionale/procedura-prevalutazione-lauree-magistrali-inglese-solo-studenti-non-eu-residenti-all.

DOMANDA DI AMMISSIONE

Coloro che intendono richiedere l'ammissione devono
1) presentare una domanda di pre-immatricolazione secondo la procedura informatica Unige.
2) presentare una domanda di ammissione on line entro una data specificata dal Manifesto (di norma nel mese di ottobre) nella quale autocertificano il possesso dei requisiti di ammissione.

REQUISITI CURRICOLARI

Nel caso di lauree italiane ottenute con ordinamenti che non prevedono crediti, o di titoli di studio ottenuti all'estero, il CCS attribuirà a ciascuna attività formativa acquisita un settore scientifico-disciplinare ed un valore in CFU.
I crediti possono essere stati ottenuti anche attraverso la frequenza di più Corsi di Studio o mediante iscrizione a singoli insegnamenti.
I suddetti requisiti curriculari sono automaticamente soddisfatti dalle lauree conseguite presso l'Università di Genova nelle seguenti classi: • Scienza dei Materiali, classe 25 - Scienze e Tecnologie Fisiche (ex DM 509/99); • Scienza dei Materiali, classe L-30 - Scienze e Tecnologie Fisiche (ex DM 270/04); L-27 Scienze e tecnologie chimiche, L-9 Ingegneria industriale. I laureati in Italia nella classe Scienza dei Materiali istituita col DM 146 del 9/2/21 soddisfano automaticamente i requisiti curricolari. I laureati nelle classi delle lauree in Scienze e Tecnologie Fisiche, Scienze e Tecnologie Chimiche, Ingegneria Industriale hanno curricula che di norma soddisfano i requisiti minimi, ma la verifica sarà effettuata caso per caso.
Qualora il candidato non sia in possesso degli specifici requisiti curriculari potrà iscriversi a singole attività formative finalizzate all'ammissione al Corso di Laurea Magistrale. I candidati che si trovino in tale condizione verranno contattati dalla Commissione per l'Ammissione alla LM.

VERIFICA DELLA PREPARAZIONE INDIVIDUALE
Tutte le domande che soddisfano i suddetti requisiti curriculari saranno esaminate per la verifica della preparazione individuale. Gli studenti italiani con voto finale della triennale inferiore a 90/110 e tutti gli studenti con titolo di ammissione conseguito all'estero dovranno sostenere con esito positivo una prova di verifica, sotto forma di colloquio pubblico o video- intervista per via telematica. La prova si svolgerà in presenza di una commissione d'esame costituita da almeno due componenti della

Commissione per le Ammissioni alla Laurea Magistrale. Negli altri casi l'accertamento dell'adeguatezza della preparazione individuale verrà effettuato da una Commissione appositamente nominata, che terrà conto di: - curriculum vitae et studiorum pregresso; - votazioni conseguite negli esami delle discipline di interesse (vedi requisiti curricolari); - eventuale prova orale che verterà sulle conoscenze di base nelle discipline matematiche, fisiche, chimiche e tecnologiche che possono essere tipicamente acquisite con una laurea di primo livello di tipo scientifico-tecnologico.
La verifica verrà effettuata in date concordate con i candidati mediante scambio di e-mail con il Coordinatore. Qualora non superata, potrà essere nuovamente sostenuta una sola volta a distanza di almeno 30 giorni dalla prima verifica.

- CURRICULUM INTERNAZIONALE (Serp+: https://www.master-serp.eu/apply/admission-criteria)

AMMISSIONE

L'ammissione all'indirizzo internazionale SERP+ è regolamentata da apposite norme oggetto di un Consortium Agreement ratificato dai Rettori delle quattro Sedi coinvolte. Valgono per il presente Corso di Studio tutte le norme previste nel Consortium Agreement relativo al Corso di Laurea Magistrale in Scienza e Ingegneria dei Materiali.
Il Master è aperto a eccellenti studenti europei ed extra-europei. Il criterio principale per l'ammissione è di avere una laurea in chimica, fisica con elementi di chimica o Scienza o Ingegneria dei Materiali, che corrisponde a 180 CFU. Inoltre, il candidato dovrà dimostrare una buona conoscenza della lingua inglese scritta e parlata almeno a livello B2 (dimostrata mediante il possesso di certificazioni TOEFL o IELTS o, Cambridge certificates). La selezione delle domande verrà svolta da una apposita commissione internazionale.
Al fine di incoraggiare l'apprendimento permanente, verranno considerate anche le domande di ammissione a seguire tutto il programma da parte di candidati con esperienza professionale.

La selezione di tutti i candidati avverrà con i criteri ed i pesi sotto menzionati:
• 50%: risultati conseguiti negli esami accademici (e professionali se del caso) con valutazione dei carichi di lavoro (CFU), adeguatezza del curriculum, voti conseguiti)
• 20%: lettera di referenza
• 10%: Inglese
• 10%: lettera di motivazione
• 10%: il coinvolgimento in associazioni, reti o altre attività extra-curriculari che mostrano attitudine alla leadership e carattere dinamico.

Le informazioni riguardanti la procedura di candidatura e selezione saranno comunicate ai candidati attraverso il sito web di SERP + (www.master-serp.eu). Un indirizzo email (master.serp@u-psud.fr) sarà disponibile anche per i candidati che volessero porre domande riguardanti la procedura di ammissione.
Quest'ultima avverrà attraverso applicazione online con la possibilità per i candidati di caricare i propri documenti e di seguire lo stato della loro domanda. I futuri studenti dovranno presentare i seguenti documenti:
• copia del passaporto
• Curriculum Vitae
• dichiarazione di motivazione personale
• copia del più alto titolo di studio conseguito

• copia del Certificato di Laurea con la trascrizione delle registrazioni degli esami sostenuti e relativo voto conseguito con allegata una spiegazione del sistema di classificazione vigente presso l'università di origine
• la prova del livello di conoscenza della lingua inglese
• lettera di referenza e informazioni di contatto di un referee.

ACCERTAMENTO DEL POSSESSO DEI REQUISITI DI AMMISSIONE

Il possesso dei requisiti di ammissione degli studenti verrà verificato congiuntamente dalla Commissione giudicatrice internazionale composta da almeno un docente di ciascun istituto partner. I commissari avranno accesso on line ai file dei candidati e potranno dare la loro valutazione sempre online utilizzando la apposita piattaforma comune predisposta a tale scopo. Ogni domanda sarà esaminata da almeno due commissari di diverse istituzioni partner. I risultati saranno registrati sulla piattaforma e discussi in una riunione in cui verrà presa la decisione finale. La commissione redige un elenco degli studenti selezionati e un elenco di riserva. La commissione giudicatrice farà in modo che l'equilibrio di genere sia rispettato e che nessun gruppo di cittadini dell'Unione europea o di cittadini di paesi terzi sia escluso o svantaggiato. I risultati della procedura saranno tempestivamente segnalati ai candidati via e-mail.

Gli studenti ammessi devono registrarsi presso le Università ove frequenteranno i diversi semestri (dal primo al terzo, il quarto essendo dedicato alla tesi di laurea). Solo queste Istituzioni rilasceranno loro il diploma. Gli studenti dovranno obbligatoriamente frequentare semestri in almeno due università del consorzio.
I documenti necessari per l'iscrizione sono elencati sul sito web di SERP + e saranno inviati via mail agli studenti prima dell'inizio del semestre. Il pagamento delle tasse di iscrizione deve essere effettuato prima della registrazione

Art. 3 – Attività formative.

Il Corso di Laurea Magistrale ha la durata di due anni durante i quali lo studente deve acquisire 120 crediti formativi (CFU). Oltre ai requisiti della classe LM-Sci Mat. il Corso di Laurea Magistrale in Advanced Materials Science and Technology ha gli obiettivi formativi specifici elencati nell'Ordinamento Didattico del Corso di Laurea Magistrale.

In allegato 1 viene riportato il quadro generale delle attività formative (rif. Ordinamento Corso di Laurea Magistrale) e il quadro delle attività previste da questo Regolamento; nella tabella excel allegata vengono elencate le attività formative del I e II anno, con gli obiettivi formativi specifici, i crediti formativi, le ore di didattica assistita e le ore di studio individuale.

1. La tipologia delle attività didattiche che producono l'acquisizione di crediti è la seguente:

- insegnamenti, eventualmente articolati in moduli, che possono prevedere, a seconda dei casi:

- lezioni frontali in aula, esercitazioni in aula, esercitazioni e attività pratiche in laboratori didattici e in laboratori di ricerca, seminari specialistici, visite guidate presso aziende; (72 cfu complessivi di insegnamenti, di cui 12 CFU a scelta libera per il curriculum ordinario e 9 per il curriculum internazionale);

- 3 CFU per lo studio di una lingua dell'unione europea diversa dalla madrelingua.

- ulteriori altre attività (3 CFU complessivi) che possono prevedere attività utili all'inserimento nel mondo del lavoro quali stage presso aziende o laboratori (di strutture esterne oppure interne all'università) finalizzate all'acquisizione di metodiche sperimentali e di abilità professionali; attività di elaborazione dati ed uso di tecnologie avanzate;

-attività relative alla Tesi e alla preparazione della prova finale (30 CFU).

Tutti gli insegnamenti sono erogati in lingua inglese.

Gli insegnamenti del Curriculum Internazionale SERP+ saranno attivati solo in caso di attivazione di tale curriculum.

2. Ad ogni credito formativo corrispondono 25 ore di lavoro totale dello studente per l'acquisizione delle relative competenze.

A seconda della tipologia di attività si ha un differente rapporto fra ore di attività didattica assistita e studio personale dello studente.

In particolare, 1 CFU di norma corrisponde a:

- 8 ore di lezione frontale + 17 ore di studio personale (frazione riservata allo studio individuale 68%);

- 10 ore di esercitazione in aula + 15 ore di studio personale (frazione riservata allo studio individuale 60%);

- 12-13 ore di attività pratica di laboratorio + 13-12 ore di studio personale (frazione riservata allo studio individuale 52%);

- l'attività di Tesi comporta un'attività dello studente fino a 25 ore per un credito, svolta sotto la supervisione di un relatore;

- 12-13 ore di altre attività + 13-12 ore di studio personale (frazione riservata allo studio individuale 52%); la frazione dell'impegno orario complessivo riservata allo studio personale non potrà mai essere inferiore al 50%, salvo per le attività a forte contenuto pratico.

Per gli insegnamenti del curriculum internazionale erogati all'estero il numero di ore di lezione, esercitazione, laboratorio sono determinati dalle rispettive Sedi in accordo alle norme ivi vigenti.

Art. 4 – Iscrizione a singole attività formative.

In conformità con l'articolo 5 del Regolamento di Ateneo per gli studenti, per iscriversi a singole attività formative occorre possedere un titolo di studio che permetta l'accesso all'Università. Considerate le caratteristiche dell'organizzazione didattica teorico-pratica, le istanze di iscrizione a singole attività formative afferenti al CdS possono essere accettate solo dopo valutazione del CCS necessaria al corretto svolgimento dei corsi stessi.

Art. 5 – Curriculum

Per il Corso di Laurea Magistrale AMST sono previsti due curricula:

il curriculum ordinario in lingua inglese e il curriculum internazionale, anch'esso in lingua inglese, con mobilità internazionale strutturata detto SERP+.

Gli studenti del curriculum internazionale sono assoggettati a condizioni di ammissione e di permanenza particolari, regolamentate dal Consortium Agreement (e dai relativi allegati) sottoscritto dai Rettori delle Sedi coinvolte.

Il CdS prevede due profili professionali:

Scienziato dei Materiali: specialista nella Ricerca che prevede l'acquisizione di conoscenze e competenze utili alla comprensione della correlazione tra le proprietà chimiche, fisiche e meccaniche dei materiali e la loro struttura su scala molecolare e micrometrica, con particolare riferimento alle loro applicazioni avanzate (quali ad esempio materiali per l'energia rinnovabile, materiali per la chimica sostenibile, materiali bidimensionali e nanostrutturati).
Conoscenze e competenze nelle tecniche di simulazione, nei metodi e nella strumentazione per la sintesi e la caratterizzazione delle proprietà chimiche, fisiche e tecnologiche dei materiali.
Competenze nella messa a punto di apparati di misura progettati ad hoc.

Scienziato dei Materiali: specialista nelle Tecnologie che prevede l'acquisizione di conoscenze e competenze utili alla comprensione della correlazione tra le proprietà chimiche, fisiche e meccaniche dei materiali e la loro struttura, con particolare riferimento alle loro applicazioni industriali (quali, ad esempio, processi di produzione e metodi di controllo qualità di materiali, dispositivi per specifiche applicazioni).
Conoscenze degli aspetti applicativi dei materiali quali ad esempio materiali metallici, polimerici, superconduttori e materiali funzionali di varia natura.
Conoscenze e competenze nelle tecniche di simulazione, nei metodi e nella strumentazione per la sintesi e la caratterizzazione delle proprietà chimiche, fisiche e tecnologiche dei materiali.

Le schede insegnamento specificano per gli insegnamenti opzionali il profilo/i per cui l'insegnamento è indicato.

Art. 6 – Impegno orario complessivo

La definizione della frazione oraria dedicata a lezioni o attività didattiche equivalenti è stabilita, per ogni insegnamento, dal CCS con corrispondenza oraria definita nell'articolo 3. Il Direttore del Dipartimento DCCI e il Coordinatore del CCS sono incaricati di verificare il rispetto delle predette prescrizioni, anche ai fini della pubblicazione dei programmi degli insegnamenti

Art. 7 – Piani di studio e Propedeuticità

Tutti gli studenti sono tenuti a presentare annualmente un Piano di Studio con l'indicazione di tutte le attività formative dell'anno, entro i termini indicati dalla Scuola di riferimento e specificati nel Manifesto degli Studi.

Gli insegnamenti non obbligatori che non prevedano almeno tre studenti non sono attivati. In casi particolari possono essere consentite deroghe in accordo con il Coordinatore del CdS e il Direttore del DCCI. Ai fini di consentire un'efficace programmazione delle attività formative gli studenti sono invitati a dichiarare preventivamente gli insegnamenti opzionali e a scelta libera che intendono inserire nel PdS entro i termini specificati nel Manifesto degli studi e comunque entro il mese di agosto. La modifica di tale indicazione è consentita in sede di presentazione del PdS, salvo nel caso in cui essa comporti la mancata attivazione di un insegnamento.

Lo studente che, nella formulazione del proprio piano di studio, segue il quadro previsto dal presente Regolamento nonché le indicazioni fornite dal Manifesto degli Studi, presenta un piano ad approvazione automatica, salvo per le scelte libere per cui il CCS valuterà la coerenza con gli obiettivi formativi del Corso di Laurea Magistrale.

Conformemente alle norme vigenti, lo studente può presentare un Piano di studi individuale, contenente attività formative diverse da quelle previste dal Regolamento didattico purché coerenti con l'ordinamento didattico del Corso di studi dell'anno di immatricolazione.

I piani di studio sono approvati dal Consiglio di Corso di Studio. I piani di studio non aderenti ai curricula inseriti nella banca dati ministeriale dell'offerta formativa, ma conformi all'ordinamento didattico ovvero articolati su una durata più breve rispetto a quella normale dovranno essere approvati sia dal CCS sia dal Consiglio del Dipartimento di riferimento.

Gli studenti sono invitati a sostenere gli esami dei vari insegnamenti seguendo le eventuali indicazioni sui prerequisiti fornite insieme ai programmi di ciascun insegnamento nel Manifesto degli Studi.

Infine non si può iniziare l'attività di Tesi se non si sono già acquisiti almeno 54 crediti per attività formative relative ad insegnamenti.

Gli studenti iscritti al curriculum internazionale (SERP+) dovranno frequentare le lezioni del I, II, III semestre in almeno due paesi diversi di loro scelta. I percorsi loro proposti sono i seguenti:

PRIMO ANNO

• **Semestre 1**: svolto in Francia su "Fondamenti e metodi per la chimica e la chimica-fisica" (28 CFU) in inglese Fundamentals and methods.

• Alla fine del primo semestre è prevista una scuola invernale che si svolgerà in Portogallo o in Polonia ad anni alterni su "Data Science" (2 CFU). Questi CFU sono erogati dall'Università di Parigi Saclay

• **Semestre 2**: potrà essere svolto in Polonia oppure in Portogallo (25 CFU):

Polonia:

Physical Chemistry and photochemistry of molecules and biomolecules

Portogallo:

Chemistry and physics of materials and interfaces for sustainability

Alla fine del secondo semestre si terrà una scuola estiva con l'obiettivo di sviluppare le capacità imprenditoriali degli studenti. La scuola si concentra su: comunicazione, project management, gestione dell'economia, NTIC (ICT), diritto europeo dei brevetti, capitale di rischio e finanziamenti, valorizzazione tecnologica, e infine sulla preparazione di un progetto professionale. La scuola si svolgerà a Genova ma i cui CFU saranno erogati da Portogallo o Polonia a seconda della mobilità dello studente.

SECONDO ANNO:

• **Il semestre 3** si può svolgere a Parigi Saclay in Francia (30 ECTS), a Unige in Italia (30 ECTS) o all'Università McGill a Monteral in Canada (60 ECTS). Se gli studenti studiano in Canada dovranno restarvi per tutto il secondo anno.

In Francia la specializzazione è: Nanomaterials for medecine and energy: from research to decision making.

In Italia: Nanostructuring at surfaces for energy harvesting, electronics and green chemistry

In Canada: Intensive Research path in physical chemistry and related fields.

I Titoli e i contenuti dei corsi erogati per ciascun semestre sono reperibili al link: https://www.master-serp.eu/

• **Semestre 4**: dedicato a 6 mesi di stage/tesi (relativi alla preparazione della prova finale, 30 CFU).

Nel corso del terzo semestre, lo studente deve proporre 3 possibili argomenti di studio per la tesi con i nomi dei potenziali supervisori e dei laboratori ove svolgere tali attività coerentemente con gli obiettivi del percorso formativo. Se lo studente propone di svolgere lo stage in un laboratorio universitario, questo deve essere ospitato da una delle istituzioni partner o da istituzioni di partner associati. Lo studente deve proporre un co-relatore, professore o industriale, residente nel suo paese natale, se possibile, attivo in un campo vicino al tema scelto per lo stage. Il co-relatore verrà invitato a prendere parte alla valutazione della relazione scritta.

Il Piano degli studi approvato congiuntamente dalle sedi (https://www.master-serp.eu/) è automaticamente riconosciuto dal CCS e approvato. Il PdS dipende dalle sedi che lo studente frequenterà nel suo percorso formativo.

La sostituzione di insegnamenti obbligatori del percorso ordinario con insegnamenti del curriculum internazionale non è consentita, fatto salvo il diritto di presentare piani di studio individuali che saranno poi esaminati caso per caso dagli organi competenti.

Art. 8 – Frequenza e modalità di svolgimento delle attività didattiche.

Le attività formative di ogni anno si svolgono in due periodi didattici (convenzionalmente chiamati semestri), con una congrua interruzione (almeno quattro settimane) al termine del primo periodo, per lo svolgimento degli esami e di altre prove di valutazione.

Le altre attività formative si svolgono in base alla specifica disponibilità temporale delle strutture interessate e alla carriera dello studente, di norma intorno alla fine del I semestre del secondo anno. L'attività relativa alla preparazione della prova finale si svolge di norma (obbligatoriamente per il curriculum internazionale) nel II semestre del II anno.

Il calendario delle attività proposte per ogni anno accademico è contenuto nel Manifesto degli Studi.

L'orario delle lezioni è annualmente reso pubblico prima dell'inizio dei corsi.

La frequenza di tutte le attività formative è fortemente consigliata agli studenti del curriculum ordinario ed obbligatoria per quelli del curriculum internazionale SERP+. La frequenza delle attività di laboratorio è obbligatoria anche per studenti lavoratori, disabili e con disturbi specifici dell'apprendimento (D.S.A.), tuttavia per tali studenti potranno essere previsti orari personalizzati, compatibilmente con la disponibilità di risorse di docenza e di strutture e strumentazione. Il CCS predisporrà per gli studenti disabili gli ausili loro necessari per acquisire una formazione pratica equivalente a quella di tutti gli altri studenti.
Per le attività di stage è richiesto l'obbligo della frequenza che va certificata dal supervisore.

Art. 9 – Esami ed altre verifiche del profitto

1. Per ciascuna attività formativa indicata nell'allegato è previsto un accertamento conclusivo individuale, nei periodi previsti per gli appelli d'esame, in date stabilite dal Consiglio di Corso di Laurea su proposte avanzate dai docenti responsabili degli insegnamenti o concordate con essi ed in coerenza con il Regolamento Didattico di Ateneo.

Possono essere previsti appelli durante il periodo delle lezioni soltanto per gli studenti che, nell'anno accademico in corso, non abbiano inserito attività formative nel proprio piano di studio.

Nel caso di prove intermedie, con il superamento dell'accertamento conclusivo lo studente acquisisce i CFU attribuiti alla attività formativa in oggetto.

Per le attività di stage o per le altre attività è necessaria una relazione sull'attività svolta controfirmata dal tutore della struttura o dal docente responsabile.

2. Per le attività formative riconducibili ad insegnamenti l'accertamento finale di cui al comma 1, oltre all'acquisizione dei relativi CFU, comporta l'attribuzione di un voto espresso in trentesimi con eventuale lode. Supera l'esame chi consegue una valutazione di almeno 18 trentesimi. Per le altre attività, tranne quelle relative alla prova finale, la valutazione è espressa con un giudizio di idoneità. Per le attività di stage e per le altre attività non riconducibili ad insegnamenti il compito di accertare il superamento della prova è demandato dal CCS al Coordinatore (o suo delegato) sentiti i responsabili delle attività stesse. Agli studenti con disabilità e agli studenti con disturbi specifici dell'apprendimento (DSA), previa richiesta esplicita inoltrata attraverso i referenti della Scuola per gli studenti con disabilità e D.S.A., sono consentite prove equipollenti e tempi più lunghi per l'effettuazione delle prove scritte. Gli studenti con disabilità svolgono gli esami con l'uso degli ausili loro necessari e, se necessario, con la presenza di assistenti, verificati e approvati dall'Ateneo, per l'autonomia e/o la comunicazione in relazione al grado e alla tipologia della loro disabilità.

Sul sito web del CCS verranno rese disponibili informazione sulle modalità di svolgimento delle altre attività.

3. Il numero degli esami o valutazioni finali del profitto necessari per il conseguimento del titolo non può essere superiore a 12 (fatto salvo il caso del curriculum internazionale). Al fine del computo vanno considerate le attività formative caratterizzanti, affini e integrative, a scelta (queste ultime conteggiate complessivamente come un solo esame).

4. Gli accertamenti finali possono consistere in: esame orale, compito scritto, relazione scritta o orale sull'attività svolta, test con domande a risposta aperta o a scelta multipla, prova pratica di laboratorio o al computer. Le modalità dell'accertamento finale, che possono comprendere anche più di una delle forme su indicate, sono indicate annualmente dal docente responsabile dell'attività formativa e approvati dal CCS prima dell'inizio delle attività didattiche. Devono essere previsti, durante ciascun anno accademico, almeno cinque appelli per gli insegnamenti che prevedono prove scritte o di laboratorio e almeno sette appelli per quelli che prevedono solo prove orali. L'intervallo tra due appelli successivi deve essere di almeno tredici giorni. Possono essere previsti appelli durante il periodo delle lezioni soltanto per gli studenti che abbiano soddisfatto tutti gli obblighi sulla frequenza previsti dal proprio piano di studio o che risultino iscritti a tempo parziale.

Per il curriculum internazionale gli appelli si svolgono con modalità compatibile con il cambiamento di sede, disciplinate dal consorzio:

5. Commissioni d'esame.

Le commissioni d'esame sono composte da almeno due membri uno dei quali è il docente responsabile dell'insegnamento. Possono essere membri della commissione cultori della materia individuati dal CCS sulla base di criteri che assicurino il possesso di requisiti scientifici, didattici o professionali.

Qualora l'esame sia relativo ad una pluralità di insegnamenti, ovvero a un insegnamento articolato in due moduli, i docenti responsabili di tali insegnamenti o moduli fanno parte obbligatoriamente della commissione.

Gli studenti del curriculum internazionale sono tenuti a conseguire tutti i crediti previsti dal loro PdS annuale entro la sessione estiva. Gli studenti che non conseguissero tale obiettivo possono chiedere l'ammissione al curriculum ordinario. Il CCS delibererà in merito ai riconoscimenti e alle modifiche del PdS atti a consentire il +conseguimento del solo titolo italiano in tali casi.

Art. 10 – Riconoscimento di crediti – obsolescenza dei crediti

- *Riconoscimento di crediti*

Europe	E=Sufficient			D=Satisfactory			C=Good			B=Very Good			A=Excellent	
Italia	18	19	20	21	22	23	24	25	26	27	28	29	30	30 e lode
Austria	4			3			2			1				
Belgio	11			12			13	14		15	16	17	18	19-20
Danimarca	02			4			7			10			12	
Finlandia	1						2			3		4		5
Francia	10-10.49	10.50-10.74	10.75-10.99	11.00-11.49	11.50-11.74	11.75-11.99	12-12.99	13.00-13.49	13.50-13.99	14.00-14.99	15.00-15-49	15.50-15.99	16	17-20
Germania	4.0		3.7		3.3		3.0		2.7	2.3	2.0	1.7	1.3	1.0
Grecia	5	6		7			8			9			9.5	10
Irlanda	40	42	44	46	48	50	52	55	58	61	64	67	70	71-100
Islanda	5			6			7			8			9-10	

Lituania/Lettonia	4			5			6			7			8		9-10		
Lussemburgo	30	31	32	33	34	35	36	37	38-39	40-49							
Malta	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80	81-84 | 85-88			89-92 | 93-96 | 97-100				
Norvegia	2						3			4			5		6		
Paesi Bassi	5.5	6		6.5		7		7.5		8			8.5	9	10		
Polonia	3			3+			4			4+					5		
Portogallo	10	11		12	13		14	15		16	17			18	19-20		
Regno Unito (centesimi)	40-50	51	52	53-55	56-58	59-61	62-63	64-65	66-69	70-73	74-76	77-80	80-90		90-100		
Spagna	5	5,1 – 5,2	5,3-5,6	5,7 – 6,0	6,1 -6,3	6,4-6,6	6,7-7,0	7,1 -7,3	7,4-7,6	7,7-8,0	8,1-8,3	8,4-8,6	8,7-9,0		9,1-10		
Svezia	G	G+			G++			Val G			Val G+				MVG		
Svizzera	4				4.5			5			5.5			6			

Il riconoscimento dei crediti conseguiti in altri corsi di studio viene effettuato a seguito di specifiche delibere del CCS: in caso di provenienza da Corsi di Studio della stessa classe, il CCS massimizzerà il riconoscimento, in coerenza con l'ordinamento Didattico, dei CFU conseguiti nei SSD corrispondenti acquisiti dallo studente nel precedente percorso formativo; in caso di provenienza da corsi di classe diversa, il CCS valuterà la congruità dei settori disciplinari e i contenuti dei corsi in cui lo studente ha maturato i crediti. A valle del riconoscimento verrà fornita assistenza allo studente nella compilazione del piano di studio da parte della commissione didattica.

Esclusivamente nel caso in cui il trasferimento dello studente sia effettuato tra corsi di laurea magistrale appartenenti alla medesima classe, la quota di crediti relativi al medesimo settore scientifico-disciplinare direttamente riconosciuti allo studente non può essere inferiore al 50% di quelli già maturati. Nel caso in cui il corso di provenienza sia svolto in modalità a distanza, la quota minima del 50% è riconosciuta solo se il corso di provenienza risulta accreditato ai sensi del decreto legislativo 27 gennaio 2012, n. 19.

Per quanto riguarda il riconoscimento di conoscenze ed abilità professionali o di attività formative non corrispondenti a insegnamenti (DM 931 01/07/2024), e per le quali non sia previsto il riferimento a un settore disciplinare, il CCS valuterà caso per caso il contenuto delle attività formative e delle conoscenze ed abilità professionali, e la loro coerenza con gli obiettivi del corso, comunque entro il limite massimo complessivo di 24 CFU. Le tipologie previste per queste attività sono: - fino ad un massimo di 8 cfu altre attività: attività professionali (lavorative presso aziende o enti), partecipazione attiva a seminari o a scuole su argomenti inerenti alla Scienza e Tecnologia

dei Materiali; attestazioni di competenze informatiche a livello specialistico; fino ad un massimo di 6 CFU di competenze linguistiche certificate -fino ad un massimo di 24 cfu : attività riconducibili agli insegnamenti a scelta libera.

- *Obsolescenza di crediti*

I crediti acquisiti nell'ambito del Corso di Laurea hanno validità per dieci anni.

Trascorso il periodo indicato, i crediti acquisiti debbono essere convalidati con apposita delibera qualora il CCS riconosca la non obsolescenza dei relativi contenuti formativi.

Qualora il CCS riconosca l'obsolescenza anche di una sola parte dei relativi contenuti formativi, lo stesso CCS stabilisce le prove integrative che dovranno essere sostenute dallo studente, definendo gli argomenti delle stesse e le modalità di verifica.

Art. 11– Mobilità, studi compiuti all'estero, scambi internazionali

Gli studenti ammessi a svolgere un periodo temporaneo di studi in altro Ateneo, sulla base di programmi o progetti riconosciuti dall'Università, dovranno ottenere che il CCS si pronunci in via preventiva sulla riconoscibilità dei crediti che intendono acquisire in detto Ateneo. Al termine del periodo di permanenza fuori sede, sulla base della certificazione esibita, il CCS delibererà di riconoscere le attività formative svolte, i relativi crediti e le valutazioni di profitto riferendole ai settori scientifico disciplinari del Corso di Laurea Magistrale e convertendole, se necessario, nel sistema di crediti adottato. Nel caso non si verifichi la precisa corrispondenza con le singole attività formative previste, ma esista una reale congruità con l'ordinamento, potrà essere adottato un piano di studio individuale.

Lo studente che intenda utilizzare programmi di mobilità studentesca all'estero dovrà presentare un piano di studio con l'indicazione degli insegnamenti e delle attività formative che seguirà presso l'Università ospitante. Tale piano di studio, che verrà valutato analizzando la coerenza formativa dell'intero percorso didattico all'estero rispetto agli obiettivi formativi del Corso di Laurea Magistrale, dovrà essere approvato preventivamente dal CCS. Al termine del periodo di mobilità i crediti acquisiti conformi al piano di studio potranno essere registrati senza bisogno di ulteriori delibere del CCS.

Per i Paesi non inclusi la corrispondenza in trentesimi verrà indicata dal Coordinatore del CCS, sentiti i Referenti Erasmus di Scuola e di CCS.

Il CCS ha avviato azioni specifiche per migliorare i livelli di internazionalizzazione del percorso formativo, anche attraverso l'inserimento strutturato all'interno dei piani di studio dei percorsi di studio all'estero: la possibilità di svolgere la tesi all'estero, la presenza del curriculum internazionale SERP+, la possibilità di svolgere attività formative in inglese nel curriculum ordinario, l'incentivo a svolgere semestri in programmi di mobilità (vedi all' art. 10 determinazione del voto di laurea) costituiscono un esempio di tali azioni.

Art. 12– Modalità della Prova finale

Per l'ammissione alla prova finale, lo studente deve aver conseguito tutti gli altri crediti formativi previsti dall'ordinamento didattico del Corso di Laurea magistrale.

L'attività di tesi, in preparazione della prova finale, consiste in un lavoro originale dello studente su un argomento di Scienza e Tecnologia dei Materiali effettuato sotto la guida e la responsabilità di un relatore; il lavoro di tesi è presentato in un elaborato scritto che ne riporta i risultati e che deve essere consegnato almeno 15 giorni

prima dell'esame di Laurea . La relazione può essere redatta in lingua italiana o in lingua inglese per il curriculum ordinario. E' redatta obbligatoriamente in lingua inglese per il curriculum internazionale.

La commissione di Laurea, presenti il relatore e il correlatore, interroga il candidato in un esame pre-laurea attribuendo un voto al lavoro di tesi e all'elaborato scritto. In caso di impossibilità ad essere presenti il relatore e/o il correlatore inviano relazione scritta al Presidente della commissione di Laurea.

Durante la seduta di laurea il candidato espone il suo lavoro in forma breve (15 min) e la commissione di laurea attribuisce il voto di laurea.

La prova finale è pubblica e consiste nella esposizione del tema dell'attività svolta e nella discussione dei risultati conseguiti davanti ad una commissione composta da almeno 5 membri, compreso il Presidente, secondo quanto stabilito dal regolamento didattico di Ateneo. La Commissione viene nominata dal Direttore del Dipartimento di riferimento. Specifiche modalità di svolgimento della prova finale, in applicazione di convenzioni per il rilascio di doppio titolo o titolo congiunto**,** sono disciplinate a parte.

Il voto di laurea è espresso in centodecimi e comprende una valutazione globale del curriculum del laureando, della Tesi e della sua presentazione e discussione in occasione della prova finale.

Il voto viene determinato come segue.

Viene effettuata la media pesata per il numero di crediti delle votazioni in trentesimi attribuite in sede di valutazione alle varie attività formative, incluso il lavoro di Tesi. Il voto relativo a tale lavoro viene attribuito dalla Commissione di Laurea per il curriculum ordinario e dalla commissione per l'esame finale SERP+ per il curriculum internazionale.

A tale media pesata, convertita in centodecimi, viene aggiunto un incremento fino ad un massimo di otto punti così determinati:

- Valutazione dell'esame di Laurea (decisa dalla commissione di laurea per il curriculum ordinario, dedotta dal voto della commissione di Parigi per il curriculum internazionale SERP+): fino a un massimo di 3 punti

- presenza di lodi nel curriculum studiorum dello studente: fino ad un massimo di 1 punto

- numero di semestri passati dallo studente all'estero in Erasmus o in attività formative internazionali riconosciute: (da 0 a 1 punto per ogni semestre, in relazione ai cfu acquisiti): fino a un massimo di 3 punti

- tempo impiegato per conseguire il titolo: fino a un massimo di 1 punto

- partecipazione a commissioni istituzionali (CCS, Dipartimento, Scuola, Ateneo): fino a 1 punto
- tirocinio esterno (6 cfu di altre attività, qualora non già valutata come attività collegata alla Tesi): fino a 0,5 punti.

Agli studenti che superano il voto di centodieci può essere attribuita la lode con voto unanime della Commissione.

La valutazione della tesi e della prova finale tiene conto dei risultati di apprendimento in termini di: conoscenza e comprensione dell'argomento, capacità di applicare le conoscenze acquisite, capacità di formulare giudizi autonomi, capacità di comunicare in modo sintetico ed esauriente in forma scritta e orale, capacità di reperire autonomamente nuove fonti di informazione e di apprenderne direttamente i contenuti ponendoli in relazione al contesto delle proprie conoscenze, capacità di inserimento in un ambiente di lavoro (interno o esterno all'università).

Gli studenti del curriculum internazionale SERP+ devono superare la prova finale entro la sessione estiva. Tale prova viene sostenuta presso l'Università di Parigi Sud, sede capofila del Master, secondo le norme previste dall'accordo consortile sottoscritto dai Rettori delle sedi coinvolte.

Art. 13– Orientamento e tutorato.

Per favorire la continuità del percorso formativo e per l'inserimento nel mondo del lavoro, il CCS ha istituito una Commissione Orientamento e Tutorato, che collabora con la commissione orientamento della Scuola e con gli altri soggetti interessati.

La stessa Commissione predisporrà un servizio di tutorato finalizzato ad assistere gli studenti lungo il corso degli studi, al fine di prevenire la dispersione ed il ritardo negli studi e di promuovere una proficua partecipazione attiva alla vita universitaria in tutte le sue forme.

La Commissione Orientamento e Tutorato costituisce un punto di riferimento per tutti gli studenti del Corso relativamente a problemi di orientamento o di altra natura didattica. Tutti i Professori ed i Ricercatori sono comunque tenuti a collaborare alle attività di tutorato.

Art. 14 - Attività di coordinamento - Verifica periodica dei crediti

Come previsto dal Regolamento Didattico di Ateneo, per il pieno raggiungimento degli obiettivi formativi del Corso di Laurea magistrale, il CCS, nel rispetto della libertà di insegnamento, coordina i programmi degli insegnamenti e delle altre attività formative, promuove il coordinamento dei docenti e valuta i risultati delle attività stesse in collaborazione con la Commissione Paritetica di Scuola. A tal fine è prevista almeno una riunione annuale del Consiglio dei Corsi di Studi in Scienza dei Materiali per la programmazione ed una per la valutazione.

Il CCS attua iniziative per la valutazione e il monitoraggio del carico di lavoro per gli studenti al fine di garantire una adeguata corrispondenza tra i CFU attribuiti alle diverse attività formative ed il carico di lavoro effettivo.

Ogni tre anni il CCS, previa opportuna valutazione, attiva una procedura di revisione del regolamento didattico, con particolare riguardo al numero dei crediti assegnati ad ogni attività formativa. La stessa procedura viene altresì attivata ogni volta in cui ne facciano richiesta al Coordinatore del CCS almeno un quarto dei componenti il Consiglio stesso.

Art. 15 – Manifesto degli Studi.

Il Manifesto degli studi, finalizzato alla massima trasparenza dell'Offerta didattica, elenca anno per anno la lista degli insegnamenti attivabili.

Fornisce ulteriori dettagli sulle domande di ammissione, incluse le condizioni di carriera dello studente che consentono la presentazione della domanda.

Indica i termini per l'iscrizione al Corso di Laurea Magistrale e per la presentazione dei piani degli studi, i periodi di svolgimento delle prove di verifica, di cui all'Art.2 del presente Regolamento, delle attività formative, e i periodi, a questi non sovrapposti, di svolgimento degli esami di profitto, con l'osservanza di quanto previsto all'art. 26, comma 4 del Regolamento Didattico di Ateneo.

Art. 16 – Organi del CCS

Il corso di Laurea è governato dal Consiglio dei Corsi di Studio (CCS) in Scienza dei Materiali, lo stesso consiglio governa anche la LT in Scienza dei Materiali. Esso è presieduto da un coordinatore, il quale nomina un vice-coordinatore, che rimane in carica fino a decadenza o dimissioni del coordinatore che lo ha nominato. La Commissione AQ del CCS è formata da un numero di docenti compreso tra 4 e 6, dal coordinatore e dal vice-coordinatore, da un rappresentante degli studenti e da un rappresentante del personale tecnico-amministrativo del Dipartimento di Chimica e Chimica Industriale o del Dipartimento di Fisica e dai Referenti per la didattica del Dipartimento di Chimica e Chimica Industriale e del Dipartimento di Fisica.

Il CCS si avvale di commissioni come descritto nell'apposito quadro della SUA-CdS.

Art. 17 – Autovalutazione

La Commissione AQ si occupa delle procedure di autovalutazione e della stesura dei documenti relativi (SUA-CdS, Commento agli Indicatori, Rapporto Ciclico di Riesame). L'organizzazione e le responsabilità della AQ a livello del Corso di Studio sono descritte in modo dettagliato nella sezione D2 della SUA-CdS. Ciascun docente accede alla valutazione dei propri insegnamenti.
Il Coordinatore del CCS accede ai risultati dei questionari compilati dagli studenti sulle attività formative seguite. Convoca privatamente i docenti a cui sono affidati insegnamenti o moduli che hanno ottenuto una valutazione inferiore ad una soglia stabilita dalla commissione AQ per concordare con gli stessi azioni concrete rivolte al miglioramento della qualità dell'attività didattica da loro svolta (o della sua percezione). Stila una relazione annuale che riporta i risultati aggregati in forma anonima.

Art. 18 – Apprendistato e alta formazione

In conformità con il protocollo di intesa tra l'Ateneo e la Regione Liguria in merito alla disciplina dell'apprendistato di alta formazione (D.lsg. 167 del 14/9/2011), qualora uno studente iscritto alla LM venga assunto da un'azienda tramite contratto di apprendistato ricadente sotto il citato protocollo di intesa, il CCS concorderà con lo studente e l'azienda un piano di studio personalizzato, purché coerente con l'ordinamento didattico. Tale percorso potrà prevedere sia la frequenza ad insegnamenti attivati presso l'Ateneo, sia attività formative ad hoc (formali, non formali o informali così come definite dall'art. 4 legge 92 del 28/6/2012) che tengano conto dei fabbisogni di professionalità delle aziende. Le attività non formali e informali non potranno comunque ammontare a più di 12 CFU. I destinatari di tali percorsi personalizzati sono studenti di età inferiore a 30 anni, che abbiano, di norma, già acquisito 50 CFU. La tesi sperimentale ed eventuali altre attività connesse verrà svolta in tali casi presso l'azienda. Per ogni studente assunto tramite contratto di apprendistato il CCS nominerà un tutor.

Art. 19 . Attività miranti al miglioramento della didattica ed alla risoluzione di eventuali criticità.

Il CCS incoraggia la partecipazione dei propri docenti alle attività promosse dal GLIA. E' compito della Commissione Didattica operare per migliorare la qualità della didattica e razionalizzarne al meglio l'organizzazione. La Commissione didattica procedendo informalmente ed in tempi rapidi prende in esame eventuali criticità segnalate da studenti, membri del CCS o risultanti dal monitoraggio in itinere delle carriere degli studenti e sentiti gli interessati propone al Consiglio eventuali azioni ove necessario.

Art. 20 – Reclami

Gli studenti che desiderino effettuare un formale reclamo possono a loro discrezione procedere in uno dei seguenti modi.

a) Informare verbalmente il Coordinatore che potrebbe risolvere autonomamente la questione.
b) Informare per iscritto Il Coordinatore che prenderà carico del reclamo e ne riferirà in CCS ed eventualmente al Direttore del Dipartimento responsabile del Corso di Laurea Magistrale.
c) Informare il Direttore del Dipartimento.
d) Rivolgersi al Garante di Ateneo.

Di tale possibilità viene fatta menzione nel sito web del CCS.

Allegato 1 Parte speciale del regolamento didattico

Quadro GENERALE delle attività Formative:

Ai sensi del vigente Ordinamento ex DM 270/2004 e successive modificazioni, le attività formative che dovranno essere acquisite dagli studenti sono distinte in Attività formative Caratterizzanti, Affini, A Scelta, Altre attività.

Tipo di Attività formativa (AF)	**Ambito**	**Sottogruppi e relativi SSD**	**RAD**		**Curriculum ordinario**	**Curriculum internazionale**
			Min	**Max**		
Caratterizzanti	**Chimica e fisica della materia**	Discipline della Fisica (FIS/01, FIS/02, FIS/03, FIS/07)	16	24	22	16
		Discipline della chimica (CHIM/02, CHIM/03, CHIM/04, CHIM/06)	18	24	22	20

	TOTALE		**35**	**44**	**44**	**36**
	Ingegneria dei Materiali ,-ING-IND/21, ING-IND/22, ING-IND/23, ING-IND/27)		**11**	**18**	**12**	**12**
Attività affini e integrative			**12**	**20**	16	18
Altre attività formative	A scelta dello studente		**8**	**12**	12	9
	Prova finale		**30**	**30**	30	30
	Ulteriori attività formative	Ulteriori conoscenze linguistiche	**3**	**6**	3	6
		Abilità informatiche e telematiche	0	5	0	2
		Tirocini formativi e di orientamento	0	5	0	5
		Altre conoscenze utili per l'inserimento nel mondo del lavoro	0	5	3	2
Totale CFU				120	120	120

LAUREA IN ADVANCED MATERIALS SCIENCE AND TECHNOLOGY: REGOLAMENTO DIDATTICO PARTE SPECIALE COORTE 2025/26

Indirizzo	Anno di corso	Codice_ins	Nome_ins	Nome_ins EN	CFU	SSD	Tipologia	Ambito	Lingua	Propedeuticità	Obiettivi formativi inglese	Ore riservate attività didattica assistita	Ore riservate allo studio personale
ORDINARIO	1	100274	ITALIAN LANGUAGE FOR FOREIGN STUDENTS (1 LEVEL)	ITALIAN LANGUAGE FOR FOREIGN STUDENTS (1 LEVEL)	3		ALTRE ATTIVITA'	Ulteriori conoscenze linguistiche	Italiano		The student will acquire the basic knowledge in the national language and a glimpse at national culture and heritage of the hosting country	24	51
ORDINARIO	1	104068	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The purpose of the course is to provide the concepts of electrochemistry and the aspects of materials science constituting the basis of the most promising electrochemical systems for energy. At the end of the course the student will have acquired theoretical knowledge on the structure and operating principle of each device, whether it be for conversion (spontaneous current flows - galvanic cells, photoelectrochemical cells - and forced - electrolysers) or for storage (secondary batteries, supercapacitors).	48	102

ORDINARIO	1	104068	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The purpose of the course is to provide the concepts of electrochemistry and the aspects of materials science constituting the basis of the most promising electrochemical systems for energy. At the end of the course the student will have acquired theoretical knowledge on the structure and operating principle of each device, whether it be for conversion (spontaneous current flows - galvanic cells, photoelectrochemical cells - and forced - electrolysers) or for storage (secondary batteries, supercapacitors).	48	102
ORDINARIO	1	108096	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The course introduces the students into some of the most relevant production and transformation processes of materials considering advanced manufacturing technologies. A special focus on materials for electrochemical systems is also considered. Therefore, the course:	48	102

ORDINARIO	1	108096	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course introduces the students into some of the most relevant production and transformation processes of materials considering advanced manufacturing technologies. A special focus on materials for electrochemical systems is also considered. Therefore, the course:	48	102
ORDINARIO	1	108098	ADVANCED CATALYTIC AND ADSORBENT MATERIALS FOR GREEN INDUSTRIAL PROCESSES		6	ING-IND/27	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course aims to introduce students to the materials and catalysts necessary for the development of the themes of "green" industrial chemistry, i.e. based on renewable and/or recycled raw materials and applied to environmental protection, in the scenario of the energy transition to be implemented through the development of sustainable processes	48	102
ORDINARIO	1	108098	ADVANCED CATALYTIC AND ADSORBENT MATERIALS FOR GREEN INDUSTRIAL PROCESSES		6	ING-IND/27	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The course aims to introduce students to the materials and catalysts necessary for the development of the themes of "green" industrial chemistry, i.e. based on renewable and/or recycled raw materials and applied to environmental protection, in the scenario of the energy transition to be implemented through	48	102

											the development of sustainable processes		
ORDINARIO	1	108102	MODELING AND NUMERICAL SIMULATION OF MATERIALS BEHAVIOR IN THE PROCESS INDUSTRY	MODELING AND NUMERICAL SIMULATION OF MATERIALS BEHAVIOR IN THE PROCESS INDUSTRY	6	ING-IND/26	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Learn the fundamental concepts of computational simulation of materials and processes of industrial interest and acquire tools and skills to solve a variety of problems within the industrial production system.	60	90
ORDINARIO	1	114435	PROPERTIES OF POLYMER-BASED MATERIALS, BIOMATERIALS AND COMPOSITES	PROPERTIES OF POLYMER-BASED MATERIALS, BIOMATERIALS AND COMPOSITES	6	CHIM/04	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Knowledge of the main chemical, rheological, mechanical and dynamic-mechanical properties of polymers, polymer composites and biomaterials. Structure-property correlations of polymers, composites and nanocomposites. Basic notions of biofunctionality, biocompatibility and hemocompatibility of polymer-based materials. Examples of specific applications and development strategies of composites, nanocomposites and biomaterials.	53	97
ORDINARIO	1	114446	OTHER TRAINING ACTIVITIES 3	OTHER TRAINING ACTIVITIES 3	3		ALTRE ATTIVITA'	Ulteriori conoscenze linguistiche	Inglese		Training activities that provide the knowledge of advanced scientific English for Italian students	30	45

ORDINARIO	1	118317	ADVANCED METALLURGY	ADVANCED METALLURGY	6	ING-IND/21	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The teaching aims to consolidate the basic metallurgical knowledge and introduce the physical and applied metallurgy, with emphasis on strengthening processes in steels, aluminium alloys and their industrial implications. The methods of alloying, plastic deformation, precipitation and secondary hardening will be examined, with reference to the effects on the main mechanical and physical properties. The course will also introduce powder metallurgy, welding and additive manufacturing techniques as well as wet and dry corrosion issues. The integration of this knowledge will enable students to develop a critical approach to the selection and optimization of metallic materials for advanced applications in areas such as manufacturing, structural engineering, and high-performance component design.	48	102

ORDINARIO	1	118317	ADVANCED METALLURGY	ADVANCED METALLURGY	6	ING-IND/21	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The teaching aims to consolidate the basic metallurgical knowledge and introduce the physical and applied metallurgy, with emphasis on strengthening processes in steels, aluminium alloys and their industrial implications. The methods of alloying, plastic deformation, precipitation and secondary hardening will be examined, with reference to the effects on the main mechanical and physical properties. The course will also introduce powder metallurgy, welding and additive manufacturing techniques as well as wet and dry corrosion issues. The integration of this knowledge will enable students to develop a critical approach to the selection and optimization of metallic materials for advanced applications in areas such as manufacturing, structural engineering, and high-performance component design.	53	97
ORDINARIO	1	118318	PHYSICAL CHEMISTRY OF CONFINED MATERIALS	PHYSICAL CHEMISTRY OF CONFINED MATERIALS	6	CHIM/02	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		This class aims to provide knowledge of the physical foundations necessary to understand the properties of confined materials and the	48	102

											chemical methods for their preparation		
ORDINARIO	1	118323	TRANSPORT AND MAGNETIC PROPERTIES IN ADVANCED MATERIALS	TRANSPORT AND MAGNETIC PROPERTIES IN ADVANCED MATERIALS	8	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		To understand the physical processes ruling the thermal and electric transport and the magnetic properties in advanced materials. To identify the key properties to be used for the choice of materials in specific applications. To learn experimental methods to characterise relevant magnetic and transport properties.	68	132
ORDINARIO	1	118324	BIO-INSPIRED MATERIALS AND DEVICES	BIO-INSPIRED MATERIALS AND DEVICES	6	FIS/07	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The course aims to provide an overview of bio-inspired materials and their use in devices for biomedical and environmental applications. The basic principles underlying material design, fabrication and characterization will be given. Laboratory activities will allow students to acquire practical skills in the development of specific biomimetic materials/devices.	56	94

ORDINARIO	1	118324	BIO-INSPIRED MATERIALS AND DEVICES	BIO-INSPIRED MATERIALS AND DEVICES	6	FIS/07	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course aims to provide an overview of bio-inspired materials and their use in devices for biomedical and environmental applications. The basic principles underlying material design, fabrication and characterization will be given. Laboratory activities will allow students to acquire practical skills in the development of specific biomimetic materials/devices.	56	94
ORDINARIO	1	118325	COMPUTING FOR MATERIAL SCIENCE	COMPUTING FOR MATERIAL SCIENCE	3	FIS/03	ALTRE ATTIVITA'	Altre conoscenze utili per l'inserimento nel mondo del lavoro	Inglese		Fundamental concepts of computing and programming in the context ot the most widespread computing systems in STEM with procedural and object-oriented imperative languages and related libraries, learning to develop small programs or modify existing code.	36	39

ORDINARIO	1	118326	METAL, INSULATORS, SEMICONDUCTORS	METAL, INSULATORS, SEMICONDUCTORS	8	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		By exploiting arguments derived from statistical and quantum physics, a description of the properties of solids at the microscopic level will be derived. Students will master the concepts of crystal lattice, lattice dynamics, and electronic band structure. The correlations of crystal lattice and bandstructure will be highlighted in order to describe metallic, semiconductor and insulator behavio. Particular emphasis will be placed in describing the electronic band structure of semiconductors. Concepts dealing with the dynamical trasport properties in semiconductors including the formation of p-n junctions will be addressed. The students will address the physical base and working principle of crucial technological devices such as Light emitting Diodes, Lasers and Solar cells.	64	136

ORDINARIO	1	118327	SOLAR ENERGY AND SOLAR CELLS	SOLAR ENERGY AND SOLAR CELLS	6	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The course, delivered in the second semester, will guide students toward a thorough understanding of the potential of solar energy to meet humankind's power needs by exploring a diverse portfolio of renewable energy conversion technologies, with a strong emphasis on photovoltaics (PV). First, they will gain insight into the physical basis of light-matter interaction, linking the optical response to the electronic band structure of materials relevant to PV technologies. Subsequently, they will acquire knowledge about solar energy radiation potential and learn how to apply solar radiation databases to assess the performance of a PV plant in a specific location. They will understand the physical foundation of the photovoltaic effect and first-generation PV technologies, which are primarily based on single-junction silicon solar cells and account for 90% of the PV market. They will also explore the physical and material-related constraints that limit PV conversion efficiency,	52	98

											addressing cutting-edge solutions and new materials currently being researched for high-efficiency devices. Finally, the students will gain hands-on laboratory experience conducting the electro-optical characterization of PV cells. During the third semester, students interested in PV may attend the course titled Inorganic Materials: From the Ground to Photovoltaics, where they will delve into the chemistry of inorganic PV materials, with a focus that goes beyond silicon technologies.		

ORDINARIO	1	118327	SOLAR ENERGY AND SOLAR CELLS	SOLAR ENERGY AND SOLAR CELLS	6	FIS/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course, delivered in the second semester, will guide students toward a thorough understanding of the potential of solar energy to meet humankind's power needs by exploring a diverse portfolio of renewable energy conversion technologies, with a strong emphasis on photovoltaics (PV). First, they will gain insight into the physical basis of light-matter interaction, linking the optical response to the electronic band structure of materials relevant to PV technologies. Subsequently, they will acquire knowledge about solar energy radiation potential and learn how to apply solar radiation databases to assess the performance of a PV plant in a specific location. They will understand the physical foundation of the photovoltaic effect and first-generation PV technologies, which are primarily based on single-junction silicon solar cells and account for 90% of the PV market. They will also explore the physical and material-related constraints that limit PV conversion efficiency,	52	98

											addressing cutting-edge solutions and new materials currently being researched for high-efficiency devices. Finally, the students will gain hands-on laboratory experience conducting the electro-optical characterization of PV cells. During the third semester, students interested in PV may attend the course titled Inorganic Materials: From the Ground to Photovoltaics, where they will delve into the chemistry of inorganic PV materials, with a focus that goes beyond silicon technologies.		

ORDINARIO	1	118328	PHYSICS: STRUCTURE OF MATTER FROM THE ATOMS TO THE SOLID STATE	PHYSICS: STRUCTURE OF MATTER FROM THE ATOMS TO THE SOLID STATE	3	FIS/03	ALTRE ATTIVITA'	Altre conoscenze utili per l'inserimento nel mondo del lavoro	Inglese		The student will review the basic concepts of general physics and statistical physics as well as those of quantum and condensed matter physics, balancing the initial knowledge due to the different backgrounds of the students. Starting with practical and foundational examples, the introductory principles of solid-state physics will be derived.	24	51
ORDINARIO	1	118329	CHEMISTRY: FROM APPLICATION TO FUNDAMENTAL PRINCIPLES	CHEMISTRY: FROM APPLICATION TO FUNDAMENTAL PRINCIPLES	3		ALTRE ATTIVITA'	Altre conoscenze utili per l'inserimento nel mondo del lavoro	Inglese		The course will review the basic concepts of inorganic and physical chemistry, to balance the initial knowledge due to the different backgrounds of the students. Starting with practical, concrete chemical examples the required basic principles will be derived.	36	39
ORDINARIO	1	118433	COMPUTATIONAL METHODS FOR MATERIAL SCIENCE	COMPUTATIONAL METHODS FOR MATERIAL SCIENCE	4	FIS/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		By the end of the course, students will have acquired the fundamental theoretical knowledge and the necessary skills to model simple systems and simulate physical processes at the nanoscale.	36	64

ORDINARIO	1	118438	PHYSICAL CHEMISTRY OF MATERIALS	PHYSICAL CHEMISTRY OF MATERIALS	8	CHIM/02	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The teaching aims to provide students with the fundamental elements needed to understand solid-state physical chemistry. In particular, it will reinforce their knowledge of the theoretical principles of diffraction through practical experiences involving the use of specific crystallographic software. Additionally, correlations between the structural and electronic properties of materials will be discussed.	68	132
ORDINARIO	1	61930	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	6	CHIM/04	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Acquisition of theoretical foundations and experimental practice with the main instrumental techniques for morphological-structural and mechanical characterization of polymeric materials	63	87
ORDINARIO	1	61930	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	6	CHIM/04	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Acquisition of theoretical foundations and experimental practice with the main instrumental techniques for morphological-structural and mechanical characterization of polymeric materials	63	87

ORDINARIO	1	94802	POLYMERS FOR ELECTRONICS AND ENERGY HARVESTING	POLYMERS FOR ELECTRONICS AND ENERGY HARVESTING	8	CHIM/04	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Basic knowledge of chemical and physical properties of conjugated polymers and organic semiconductors. Use of such materials in organic optoelectronics and photonic devices (sensors, transistors, led and photovoltaic cells)	79	121
ORDINARIO	1	95614	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Provide students with the capability to manage new material items based upon an engineering point of view focused on the device need and constraints when created with advanced innovative materials. Carbon fiber as well as ceramic based composites and the technologies to produce, treat, stabilize them will be presented and studied in their specific features. Application methodologies with their main advantages and possible problems will be discussed with the students. Regulatory frameworks, specifically devoted to bring a new product on the market and to taking care of strict biomedical needs, will be also highlighted by a specific 8 hrs short course. Comparison between European and Usa normative will be	48	102

											illustrated. Continuous comparative analysis between the scientific and industrial viewpoints will be performed in classroom.		

ORDINARIO	1	95614	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		Provide students with the capability to manage new material items based upon an engineering point of view focused on the device need and constraints when created with advanced innovative materials. Carbon fiber as well as ceramic based composites and the technologies to produce, treat, stabilize them will be presented and studied in their specific features. Application methodologies with their main advantages and possible problems will be discussed with the students. Regulatory frameworks, specifically devoted to bring a new product on the market and to take care of strict biomedical needs, will be also highlighted by a specific 8 hrs short course. Comparison between European and Usa normative will be illustrated. Continuous comparative analysis between the scientific and industrial viewpoints will be performed in classroom.	48	102

ORDINARIO	2	104068	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The purpose of the course is to provide the concepts of electrochemistry and the aspects of materials science constituting the basis of the most promising electrochemical systems for energy. At the end of the course the student will have acquired theoretical knowledge on the structure and operating principle of each device, whether it be for conversion (spontaneous current flows - galvanic cells, photoelectrochemical cells - and forced - electrolysers) or for storage (secondary batteries, supercapacitors).	48	102
ORDINARIO	2	104068	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The purpose of the course is to provide the concepts of electrochemistry and the aspects of materials science constituting the basis of the most promising electrochemical systems for energy. At the end of the course the student will have acquired theoretical knowledge on the structure and operating principle of each device, whether it be for conversion (spontaneous current flows - galvanic cells, photoelectrochemical	48	102

											cells - and forced - electrolysers) or for storage (secondary batteries, supercapacitors).		
ORDINARIO	2	108096	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The course introduces the students into some of the most relevant production and transformation processes of materials considering advanced manufacturing technologies. A special focus on materials for electrochemical systems is also considered. Therefore, the course:	48	102
ORDINARIO	2	108096	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	MATERIALS FOR ADVANCED MANUFACTURING AND ELECTROCHEMICAL TECHNOLOGIES	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course introduces the students into some of the most relevant production and transformation processes of materials considering advanced manufacturing technologies. A special focus on materials for electrochemical systems is also considered. Therefore, the course:	48	102
ORDINARIO	2	108098	ADVANCED CATALYTIC AND ADSORBENT MATERIALS FOR GREEN INDUSTRIAL PROCESSES		6	ING-IND/27	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The course aims to introduce students to the materials and catalysts necessary for the development of the themes of "green" industrial chemistry, i.e. based on renewable and/or recycled raw materials and applied to environmental protection, in the scenario of the energy transition to be	48	102

											implemented through the development of sustainable processes		
ORDINARIO	2	108098	ADVANCED CATALYTIC AND ADSORBENT MATERIALS FOR GREEN INDUSTRIAL PROCESSES		6	ING-IND/27	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course aims to introduce students to the materials and catalysts necessary for the development of the themes of "green" industrial chemistry, i.e. based on renewable and/or recycled raw materials and applied to environmental protection, in the scenario of the energy transition to be implemented through the development of sustainable processes	48	102
ORDINARIO	2	108102	MODELING AND NUMERICAL SIMULATION OF MATERIALS BEHAVIOR IN THE PROCESS INDUSTRY	MODELING AND NUMERICAL SIMULATION OF MATERIALS BEHAVIOR IN THE PROCESS INDUSTRY	6	ING-IND/26	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Learn the fundamental concepts of computational simulation of materials and processes of industrial interest and acquire tools and skills to solve a variety of problems within the industrial production system.	60	90

ORDINARIO	2	114435	PROPERTIES OF POLYMER-BASED MATERIALS, BIOMATERIALS AND COMPOSITES	PROPERTIES OF POLYMER-BASED MATERIALS, BIOMATERIALS AND COMPOSITES	6	CHIM/04	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Knowledge of the main chemical, rheological, mechanical and dynamic-mechanical properties of polymers, polymer composites and biomaterials. Structure-property correlations of polymers, composites and nanocomposites. Basic notions of biofunctionality, biocompatibility and hemocompatibility of polymer-based materials. Examples of specific applications and development strategies of composites, nanocomposites and biomaterials.	53	97

ORDINARIO	2	118316	INORGANIC MATERIALS FROM THE GROUND TO PHOTOVOLTAICS	INORGANIC MATERIALS FROM THE GROUND TO PHOTOVOLTAICS	6	CHIM/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The students will appreciate the potential of photovoltaics (PV) as a viable paradigm for the conversion of solar irradiation into electricity to satisfy humankind's power needs. After having dealt with the foundations of PV and first-generation PV technologies in the course entitled "Solar Energy and Solar Cells" (second semester), students of this course at the third semester will learn to classify and analyse inorganic crystalline materials based on their composition and chemical bonding. They will understand and apply both classical and quantum-mechanical based bonding and electronic structure theories to selected inorganic PV materials. They will describe the relationship between crystal structure, bonding type, and physical properties. They will appreciate the impact and relevance of point and extended defects in such materials during fabrication and operation, with a focus on second generation technologies, known as thin films. Based on the chemical nature of the	48	102

											various PV materials, they will learn some basic principles for the design of effective fabrication routes.		

ORDINARIO	2	118316	INORGANIC MATERIALS FROM THE GROUND TO PHOTOVOLTAICS	INORGANIC MATERIALS FROM THE GROUND TO PHOTOVOLTAICS	6	CHIM/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The students will appreciate the potential of photovoltaics (PV) as a viable paradigm for the conversion of solar irradiation into electricity to satisfy humankind's power needs. After having dealt with the foundations of PV and first-generation PV technologies in the course entitled "Solar Energy and Solar Cells" (second semester), students of this course at the third semester will learn to classify and analyse inorganic crystalline materials based on their composition and chemical bonding. They will understand and apply both classical and quantum-mechanical based bonding and electronic structure theories to selected inorganic PV materials. They will describe the relationship between crystal structure, bonding type, and physical properties. They will appreciate the impact and relevance of point and extended defects in such materials during fabrication and operation, with a focus on second generation technologies, known as thin films. Based on the chemical nature of the	48	102

											various PV materials, they will learn some basic principles for the design of effective fabrication routes.		

ORDINARIO	2	118317	ADVANCED METALLURGY	ADVANCED METALLURGY	6	ING-IND/21	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The teaching aims to consolidate the basic metallurgical knowledge and introduce the physical and applied metallurgy, with emphasis on strengthening processes in steels, aluminium alloys and their industrial implications. The methods of alloying, plastic deformation, precipitation and secondary hardening will be examined, with reference to the effects on the main mechanical and physical properties. The course will also introduce powder metallurgy, welding and additive manufacturing techniques as well as wet and dry corrosion issues. The integration of this knowledge will enable students to develop a critical approach to the selection and optimization of metallic materials for advanced applications in areas such as manufacturing, structural engineering, and high-performance component design.	53	97

ORDINARIO	2	118317	ADVANCED METALLURGY	ADVANCED METALLURGY	6	ING-IND/21	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The teaching aims to consolidate the basic metallurgical knowledge and introduce the physical and applied metallurgy, with emphasis on strengthening processes in steels, aluminium alloys and their industrial implications. The methods of alloying, plastic deformation, precipitation and secondary hardening will be examined, with reference to the effects on the main mechanical and physical properties. The course will also introduce powder metallurgy, welding and additive manufacturing techniques as well as wet and dry corrosion issues. The integration of this knowledge will enable students to develop a critical approach to the selection and optimization of metallic materials for advanced applications in areas such as manufacturing, structural engineering, and high-performance component design.	48	102
ORDINARIO	2	118318	PHYSICAL CHEMISTRY OF CONFINED MATERIALS	PHYSICAL CHEMISTRY OF CONFINED MATERIALS	6	CHIM/02	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		This class aims to provide knowledge of the physical foundations necessary to understand the properties of confined materials and the	48	102

											chemical methods for their preparation		
ORDINARIO	2	118324	BIO-INSPIRED MATERIALS AND DEVICES	BIO-INSPIRED MATERIALS AND DEVICES	6	FIS/07	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course aims to provide an overview of bio-inspired materials and their use in devices for biomedical and environmental applications. The basic principles underlying material design, fabrication and characterization will be given. Laboratory activities will allow students to acquire practical skills in the development of specific biomimetic materials/devices.	56	94
ORDINARIO	2	118324	BIO-INSPIRED MATERIALS AND DEVICES	BIO-INSPIRED MATERIALS AND DEVICES	6	FIS/07	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The course aims to provide an overview of bio-inspired materials and their use in devices for biomedical and environmental applications. The basic principles underlying material design, fabrication and characterization will be given. Laboratory activities will allow students to acquire practical skills in the development of specific biomimetic materials/devices.	56	94

ORDINARIO	2	118327	SOLAR ENERGY AND SOLAR CELLS	SOLAR ENERGY AND SOLAR CELLS	6	FIS/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The course, delivered in the second semester, will guide students toward a thorough understanding of the potential of solar energy to meet humankind's power needs by exploring a diverse portfolio of renewable energy conversion technologies, with a strong emphasis on photovoltaics (PV). First, they will gain insight into the physical basis of light-matter interaction, linking the optical response to the electronic band structure of materials relevant to PV technologies. Subsequently, they will acquire knowledge about solar energy radiation potential and learn how to apply solar radiation databases to assess the performance of a PV plant in a specific location. They will understand the physical foundation of the photovoltaic effect and first-generation PV technologies, which are primarily based on single-junction silicon solar cells and account for 90% of the PV market. They will also explore the physical and material-related constraints that limit PV conversion efficiency,	52	98

											addressing cutting-edge solutions and new materials currently being researched for high-efficiency devices. Finally, the students will gain hands-on laboratory experience conducting the electro-optical characterization of PV cells. During the third semester, students interested in PV may attend the course titled Inorganic Materials: From the Ground to Photovoltaics, where they will delve into the chemistry of inorganic PV materials, with a focus that goes beyond silicon technologies.		

ORDINARIO	2	118327	SOLAR ENERGY AND SOLAR CELLS	SOLAR ENERGY AND SOLAR CELLS	6	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The course, delivered in the second semester, will guide students toward a thorough understanding of the potential of solar energy to meet humankind's power needs by exploring a diverse portfolio of renewable energy conversion technologies, with a strong emphasis on photovoltaics (PV). First, they will gain insight into the physical basis of light-matter interaction, linking the optical response to the electronic band structure of materials relevant to PV technologies. Subsequently, they will acquire knowledge about solar energy radiation potential and learn how to apply solar radiation databases to assess the performance of a PV plant in a specific location. They will understand the physical foundation of the photovoltaic effect and first-generation PV technologies, which are primarily based on single-junction silicon solar cells and account for 90% of the PV market. They will also explore the physical and material-related constraints that limit PV conversion efficiency,	52	98

											addressing cutting-edge solutions and new materials currently being researched for high-efficiency devices. Finally, the students will gain hands-on laboratory experience conducting the electro-optical characterization of PV cells. During the third semester, students interested in PV may attend the course titled Inorganic Materials: From the Ground to Photovoltaics, where they will delve into the chemistry of inorganic PV materials, with a focus that goes beyond silicon technologies.		

ORDINARIO	2	118354	NANOSTRUCTURES	NANOSTRUCTURES	6	FIS/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		"Knowledge of the main experimental techniques specific to the field. Reading and deepening of a scientific article. Introduction to a multidisciplinary experimental approach. By the end of the course, the student must have gained autonomy in critically reading a scientific article, understanding its modeling and experimental parts. He or she must also be able to expound an argument clearly and comprehensively. Considering the topics covered, the teaching is suitable for the professional profile choice ""Materials Scientist: research specialist""."	48	102
ORDINARIO	2	118354	NANOSTRUCTURES	NANOSTRUCTURES	6	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		"Knowledge of the main experimental techniques specific to the field. Reading and deepening of a scientific article. Introduction to a multidisciplinary experimental approach. By the end of the course, the student must have gained autonomy in critically reading a scientific article, understanding its modeling and experimental parts. He or she must also be able to expound an argument clearly and comprehensively.	48	102

											Considering the topics covered, the teaching is suitable for the professional profile choice ""Materials Scientist: research specialist""."		
ORDINARIO	2	118355	NANOSTRUCTURED MAGNETIC MATERIALS	NANOSTRUCTURED MAGNETIC MATERIALS	6	CHIM/02	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		The teaching will provide the student with the basic elements of the physical chemistry of magnetic materials. By the correlation of morpho-structural features, chemical-physical properties, and synthetic techniques the student will be trained in the design nanostructured magnetic materials for specific applications.	53	97

ORDINARIO	2	118355	NANOSTRUCTURED MAGNETIC MATERIALS	NANOSTRUCTURED MAGNETIC MATERIALS	6	CHIM/02	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The teaching will provide the student with the basic elements of the physical chemistry of magnetic materials. By the correlation of morpho-structural features, chemical-physical properties, and synthetic techniques the student will be trained in the design nanostructured magnetic materials for specific applications.	53	97
ORDINARIO	2	61930	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	6	CHIM/04	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Acquisition of theoretical foundations and experimental practice with the main instrumental techniques for morphological-structural and mechanical characterization of polymeric materials	63	87
ORDINARIO	2	61930	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	LABORATORY OF POLYMERIC MATERIALS CHARACTERIZATION	6	CHIM/04	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Acquisition of theoretical foundations and experimental practice with the main instrumental techniques for morphological-structural and mechanical characterization of polymeric materials	63	87

ORDINARIO	2	61936	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	6	FIS/03	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Relevance of surfaces and interfaces in Nanoscience and Nanotechnology. The course will introduce a) the surface excess quantities and thermodynamical properties of surfaces; b) the surface crystallographic structure with relaxation and reconstruction phenomena; c) the surface electronic ground state properties and the surface states; d) the surface magnetic properties. Specific cases for semiconductors, oxide and insulator surfaces, graphene and other ultrathin films will be discussed with respect to dimensionality with extension towards one and zero dimensions, i.e atomic wires, surface steps and clusters. Excited states at surfaces will be treated: surface phonon spectra, surface electronic and magnetic excitations. Connections to plasmonics, Energy harvesting in solar cells and photoinduced chemistry will be stressed. Gas-Surface interaction, physisorption and chemisorption, dynamics of the interaction, adsorption,	54	96

											desorption, sticking and simple catalytic reactions will be discussed. Crystal growth, MBE, CVD, ablation techniques, nanosized films and clusters will be introduced as well as self-assembled monolayers, artificial nanostructures and surface functionalization. Experimental methods for surface characterization, like Scanning Probe Microscopies and Diffraction Methods, as well as Surface Sensitive Electronic and Vibrational Spectroscopies will be introduced.		

ORDINARIO	2	61936	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	6	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Relevance of surfaces and interfaces in Nanoscience and Nanotechnology. The course will introduce a) the surface excess quantities and thermodynamical properties of surfaces; b) the surface crystallographic structure with relaxation and reconstruction phenomena; c) the surface electronic ground state properties and the surface states; d) the surface magnetic properties. Specific cases for semiconductors, oxide and insulator surfaces, graphene and other ultrathin films will be discussed with respect to dimensionality with extension towards one and zero dimensions, i.e atomic wires, surface steps and clusters. Excited states at surfaces will be treated: surface phonon spectra, surface electronic and magnetic excitations. Connections to plasmonics, Energy harvesting in solar cells and photoinduced chemistry will be stressed. Gas-Surface interaction, physisorption and chemisorption, dynamics of the interaction, adsorption,	54	96

											desorption, sticking and simple catalytic reactions will be discussed. Crystal growth, MBE, CVD, ablation techniques, nanosized films and clusters will be introduced as well as self-assembled monolayers, artificial nanostructures and surface functionalization. Experimental methods for surface characterization, like Scanning Probe Microscopies and Diffraction Methods, as well as Surface Sensitive Electronic and Vibrational Spectroscopies will be introduced.		
ORDINARIO	2	62737	MASTER THESIS	MASTER THESIS	30		PROVA FINALE	Per la prova finale				0	750

ORDINARIO	2	95614	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		Provide students the capability to manage new material items based upon an engineering point of view focused on the device need and constraints when created with advanced innovative materials. Carbon fiber as well as ceramic based composites and the technologies to produce, treat, stabilize them will be presented and studied in their specific features. Application methodologies with their main advantages and possible problems will be discussed with the students. Regulatory frameworks, specifically devoted to bring a new product on the market and to take care of strict biomedical needs, will be also highlighted by a specific 8 hrs short course. Comparison between European and Usa normative will be illustrated. Continuous comparative analysis between the scientific and industrial viewpoints will be performed in classroom.	48	102

ORDINARIO	2	95614	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	COMPOSITE MATERIALS FOR BIO-MEDICAL APPLICATION	6	ING-IND/22	AFFINI O INTEGRATIVE	Attività formative affini o integrative	Inglese		Provide students the capability to manage new material items based upon an engineering point of view focused on the device need and constraints when created with advanced innovative materials. Carbon fiber as well as ceramic based composites and the technologies to produce, treat, stabilize them will be presented and studied in their specific features. Application methodologies with their main advantages and possible problems will be discussed with the students. Regulatory frameworks, specifically devoted to bring a new product on the market and to take care of strict biomedical needs, will be also highlighted by a specific 8 hrs short course. Comparison between European and Usa normative will be illustrated. Continuous comparative analysis between the scientific and industrial viewpoints will be performed in classroom.	48	102

INTERNAZIONALE	1	95028	SUMMER SCHOOL: ENTREPRENEURSHIP	SUMMER SCHOOL: ENTREPRENEURSHIP	5		ALTRE ATTIVITA'	Tirocini formativi e di orientamento	Inglese		Deals with the necessity to fill the gap between the scientific and technical knowledge acquired by the students at the University and the requests they will have to face in their work career either in academic institutions or industry: in other words with the necessity to develop entrepreneurship.	40	51
INTERNAZIONALE	2	100274	ITALIAN LANGUAGE FOR FOREIGN STUDENTS (1 LEVEL)	ITALIAN LANGUAGE FOR FOREIGN STUDENTS (1 LEVEL)	3		ALTRE ATTIVITA'	Ulteriori conoscenze linguistiche	Italiano		The student will acquire the basic knowledge in the national language and a glimpse at national culture and heritage of the hosting country	24	51
INTERNAZIONALE	2	104068	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	ELECTROCHEMICAL SYSTEMS FOR FUEL AND ELECTROLYSIS CELLS AND BATTERIES	6	ING-IND/22	CARATTERIZZANTI	Ingegneria dei materiali	Inglese		The purpose of the course is to provide the concepts of electrochemistry and the aspects of materials science constituting the basis of the most promising electrochemical systems for energy. At the end of the course the student will have acquired theoretical knowledge on the structure and operating principle of each device, whether it be for conversion (spontaneous current flows - galvanic cells, photoelectrochemical cells - and forced - electrolysers) or for storage (secondary	48	102

											batteries, supercapacitors).		
INTERNAZIONALE	2	104071	SCIENTIFIC WRITING, INDUSTRIAL SEMINARS	SCIENTIFIC WRITING, INDUSTRIAL SEMINARS	2		ALTRE ATTIVITA'	Altre conoscenze utili per l'inserimento nel mondo del lavoro	Inglese		The students will also acquire knowledge on scientific writing and bibliometry. Visits to industrial sites and seminars given by industrials will make the students acquainted to the problematics of industrial	16	34
INTERNAZIONALE	2	104073	LABORATORY ON DEVICE BUILDING-NANOSTRUCTURED MAGNETIC MATERIALS: A TECHNOLOGICAL APPROACH	LABORATORY ON DEVICE BUILDING-NANOSTRUCTURED MAGNETIC MATERIALS: A TECHNOLOGICAL APPROACH	3	CHIM/02	A SCELTA	A scelta dello studente	Inglese		This teaching will teach students how to design nanostructured magnetic materials (NMM) with tunable magnetic properties. Students will learn the main wet chemistry synthesis method of NMM focusing on magnetic nanoparticles. Then, by the correlation between crystalline structure, morphology and magnetic properties, the morpho-structural feature of the materials will be optimized for specific application (e.g. magnetic separation, drug delivery, magnetic hyperthermia, MRI).	40	35
INTERNAZIONALE	2	104818	MASTER THESIS	MASTER THESIS	30		PROVA FINALE	Per la prova finale				0	750

INTERNAZIONALE	2	111263	LABORATORY ON DEVICE BUILDING ORGANIC PHOTOVOLTAIC (OPV) CELL	LABORATORY ON DEVICE BUILDING ORGANIC PHOTOVOLTAIC (OPV) CELL	3		A SCELTA	A scelta dello studente				0	0
INTERNAZIONALE	2	111264	I MODULE PROJECT BASED LABORATORY ON ORGANIC PHOTOVOLTAIC (OPV) CELL	I MODULE PROJECT BASED LABORATORY ON ORGANIC PHOTOVOLTAIC (OPV) CELL	1	CHIM/04	A SCELTA	A scelta dello studente	Inglese		In this project-based laboratory course students will be guided through the basic experimental procedures for the fabrication and characterization of organic photovoltaic (OPV) cells. Each step of the OPV cell fabrication will be done by the students independently and actively, but under continuous guidance and supervision of a tutor. Students will be then guided through the most appropriate experimental techniques and procedures. Once the device is fabricated and characterized, students will be engaged in a critical analysis of the results exploiting basic concepts learnt in other courses. To achieve this goal, students will avail themselves of a laboratory entirely dedicated to this activity, aiming to a “learn by making” instruction level.	13	12

INTERNAZIONALE	2	111265	II MODULE PROJECT BASED LABORATORY ON ORGANIC PHOTOVOLTAIC (OPV) CELL	II MODULE PROJECT BASED LABORATORY ON ORGANIC PHOTOVOLTAIC (OPV) CELL	2	FIS/03	A SCELTA	A scelta dello studente	Inglese		In this project-based laboratory course students will be guided through the basic experimental procedures for the fabrication and characterization of organic photovoltaic (OPV) cells. Each step of the OPV cell fabrication will be done by the students independently and actively, but under continuous guidance and supervision of a tutor. Students will be then guided through the most appropriate experimental techniques and procedures. Once the device is fabricated and characterized, students will be engaged in a critical analysis of the results exploiting basic concepts learnt in other courses. To achieve this goal, students will avail themselves of a laboratory entirely dedicated to this activity, aiming to a “learn by making” instruction level.	24	26

INTERNAZIONALE	2	61936	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	SURFACE SCIENCE AND NANOSTRUCTURING AT SURFACE	6	FIS/03	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Relevance of surfaces and interfaces in Nanoscience and Nanotechnology. The course will introduce a) the surface excess quantities and thermodynamical properties of surfaces; b) the surface crystallographic structure with relaxation and reconstruction phenomena; c) the surface electronic ground state properties and the surface states; d) the surface magnetic properties. Specific cases for semiconductors, oxide and insulator surfaces, graphene and other ultrathin films will be discussed with respect to dimensionality with extension towards one and zero dimensions, i.e atomic wires, surface steps and clusters. Excited states at surfaces will be treated: surface phonon spectra, surface electronic and magnetic excitations. Connections to plasmonics, Energy harvesting in solar cells and photoinduced chemistry will be stressed. Gas-Surface interaction, physisorption and chemisorption, dynamics of the interaction, adsorption,	54	96

											desorption, sticking and simple catalytic reactions will be discussed. Crystal growth, MBE, CVD, ablation techniques, nanosized films and clusters will be introduced as well as self-assembled monolayers, artificial nanostructures and surface functionalization. Experimental methods for surface characterization, like Scanning Probe Microscopies and Diffraction Methods, as well as Surface Sensitive Electronic and Vibrational Spectroscopies will be introduced.		
INTERNAZIONALE	2	66402	CHEMISTRY AND TECHNOLOGY OF CATALYSIS + LABORATORY	CHEMISTRY AND TECHNOLOGY OF CATALYSIS + LABORATORY	5	CHIM/04	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		The aim of the teaching is to provide the basic knowledge on the preparation, characterization, and application of heterogeneous catalysts, also through practical laboratory experiences, introducing the student to the definition of sustainable processes.	50	75

INTERNAZIONALE	2	94802	POLYMERS FOR ELECTRONICS AND ENERGY HARVESTING	POLYMERS FOR ELECTRONICS AND ENERGY HARVESTING	5	CHIM/04	CARATTERIZZANTI	Chimica e fisica della materia	Inglese		Basic knowledge of chemical and physical properties of conjugated polymers and organic semiconductors. Use of such materials in organic optoelectronics and photonic devices (sensors, transistors, led and photovoltaic cells)	40	85