ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

REGOLAMENTO DIDATTICO DEL CORSO

LM-54 [PHOTOCHEMISTRY AND MOLECULAR MATERIALS]

Sede di Bologna

INDICE

Corso di Laurea Magistrale in
Photochemistry and Molecular materials

ART. 1 REQUISITI PER L'ACCESSO AL CORSO

- **<u>Conoscenze richieste per l'accesso</u>**

Per essere ammessi al corso di laurea magistrale in Photochemistry and Molecular Materials occorre essere in possesso di una laurea o del diploma universitario di durata triennale, ovvero di altro titolo di studio conseguito all'estero, riconosciuto idoneo.

Occorre, altresì, il possesso dei seguenti requisiti curriculari:

a). avere conseguito la Laurea in una delle seguenti classi:

- ex D.M. 270:

  L-27 Scienze e Tecnologie Chimiche
  LM-13 Farmacia e Farmacia Industriale

- ex. D.M. 509/99:

  L-21 - Scienze e Tecnologie Chimiche
  14/S - Farmacia e Farmacia Industriale

- Previgente ordinamento (ante ex D.M.509/99):

  Laurea in Chimica e Chimica Industriale

b) In caso di altro titolo posseduto, occorre avere acquisito almeno 60 CFU in discipline scientifiche di base, di cui almeno 20 CFU nei seguenti settori scientifico disciplinari: da CHIM/01 a CHIM/12; BIO/10 - BIO/11; da ING-IND/22 a ING-IND/27. È richiesta inoltre una buona preparazione di base di chimica fisica. Tale preparazione sarà valutata principalmente sulla base dei programmi dei corsi frequentati in precedenza (laurea o laurea a ciclo unico);

c) Gli studenti in possesso di titolo di studio estero dovranno possedere un titolo di studio riconosciuto idoneo ed equivalente a quelli previsti ai punti 1 e 2 per gli studenti con titolo di studio italiano. La valutazione sarà effettuata con modalità definite annualmente dal Consiglio di Corso di Studio.

L'ammissione al corso di laurea magistrale è subordinata, inoltre, al superamento di una verifica dell'adeguatezza della personale preparazione che avverrà secondo le modalità definite nel punto modalità di ammissione.

È richiesta inoltre la conoscenza della lingua inglese di livello B2 del Quadro comune europeo di riferimento per la conoscenza delle lingue.

- **Modalità di ammissione**

La verifica dell'adeguatezza della personale preparazione effettuata da parte di una Commissione sarà effettuata attraverso l'analisi del curriculum al quale potrà seguire un colloquio, in lingua inglese, secondo le modalità, i criteri e le procedure fissate dal Consiglio di Corso di Studio e rese note tramite pubblicazione sul portale di Ateneo.

La verifica dell'adeguatezza della personale preparazione è considerata assolta per gli studenti in possesso di idonea certificazione. Sono esonerati dalla presentazione dell'attestato/certificato relativo alla conoscenza della lingua inglese i laureati in corsi di studio la cui lingua ufficiale di insegnamento è l'inglese, e i laureati di madre lingua inglese.

ART. 2 REGOLE DI MOBILITÀ FRA I CURRICULA DEL CORSO DI STUDIO

Il corso di studio è articolato in curricula.

Lo studente può effettuare le scelte indicate nel piano didattico, con le modalità indicate nel piano stesso e nei termini resi noti tramite il Portale di Ateneo.

È consentito il passaggio tra i curricula previsti entro i termini resi noti tramite il Portale di Ateneo.

ART.3 PIANI DI STUDIO INDIVIDUALI

È prevista la possibilità di presentazione di piani di studio individuali con le modalità, i criteri e i termini resi noti tramite il Portale di Ateneo.

I piani di studio individuali, approvati dal Consiglio di corso di studi, non possono comunque prescindere dal rispetto dell'ordinamento e delle linee guida definite dagli Organi competenti.

Qualora il piano di studio preveda la scelta di attività formative attivate presso corsi di studio a numero programmato, l'ammissione alle stesse deve essere previamente approvata anche dal Consiglio di corso di studio a numero programmato sulla base di criteri da questo preventivamente individuati.

ART. 4 MODALITÀ DI SVOLGIMENTO DELLE ATTIVITÀ FORMATIVE E TIPOLOGIA DELLE FORME DIDATTICHE

Il piano didattico allegato indica le modalità di svolgimento delle attività formative e la relativa suddivisione in ore di didattica frontale, di esercitazioni pratiche o di tirocinio, nonché la tipologia delle forme didattiche.

Eventuali ulteriori informazioni ad esse relative saranno rese note annualmente sul Portale di Ateneo.

ART. 5 FREQUENZA E PROPEDEUTICITÀ

L'obbligo di frequenza alle attività didattiche è indicato nel piano didattico allegato, così come le eventuali propedeuticità delle singole attività formative.

Le modalità e la verifica dell'obbligo di frequenza, ove previsto, sono stabilite annualmente dal Corso di Studio in sede di presentazione della programmazione didattica e rese note agli studenti prima dell'inizio delle lezioni tramite il Portale di Ateneo.

ART. 6 PERCORSO FLESSIBILE

Lo studente può optare per il percorso flessibile che consente di completare il corso di studio in un tempo superiore o inferiore alla durata normale secondo le modalità definite nel Regolamento Didattico di Ateneo.

Le attività formative previste dal percorso di studio, in caso di necessaria disattivazione, potranno essere sostituite, per garantire la qualità e la sostenibilità dell'offerta didattica.

ART. 7 PROVE DI VERIFICA DELLE ATTIVITÀ FORMATIVE

Il piano didattico allegato prevede i casi in cui le attività formative si concludono con un esame con votazione in trentesimi ovvero con un giudizio di idoneità.

Le modalità di svolgimento delle verifiche sono stabilite annualmente dal Consiglio del Corso di Studio in sede di presentazione della programmazione didattica e rese note agli studenti prima dell'inizio delle lezioni tramite il Portale di Ateneo.

ART. 8 ATTIVITÀ FORMATIVE A SCELTA DELLO STUDENTE

Il Corso di studio considera coerenti con il progetto formativo le attività formative individuate dal Consiglio di Corso di studio e previste nell'allegato piano didattico.

Se lo studente sceglie un'attività formativa diversa da quelle considerate coerenti, secondo i suddetti criteri predeterminati, deve fare richiesta al Consiglio di corso di studio nei termini previsti annualmente e resi noti tramite pubblicazione sul Portale di Ateneo.

Il Consiglio valuterà la coerenza della scelta con il percorso formativo dello studente.

ART. 9 CRITERI DI RICONOSCIMENTO DEI CREDITI ACQUISITI IN CORSI DI STUDIO DELLA STESSA CLASSE

I crediti formativi universitari acquisiti sono riconosciuti per non meno della metà e fino a concorrenza dei crediti dello stesso settore scientifico disciplinare previsti dall'ordinamento didattico del corso di studio.

Qualora, effettuati i riconoscimenti in base alle norme del presente regolamento, residuino crediti non utilizzati, il Consiglio di Corso di studio può riconoscerli valutando il caso concreto sulla base delle affinità didattiche e culturali.

Il riconoscimento è relativo ad insegnamenti impartiti o alle attività formative svolte in lingua inglese.

ART. 10 CRITERI DI RICONOSCIMENTO DEI CREDITI ACQUISITI IN CORSI DI STUDIO DI DIVERSA CLASSE, PRESSO UNIVERSITÀ TELEMATICHE E IN UNIVERSITÀ ESTERE

I crediti formativi universitari acquisiti sono riconosciuti dal Consiglio di Corso di studio sulla base dei seguenti criteri:

- analisi del programma svolto

- valutazione della congruità dei settori scientifico disciplinari e dei contenuti delle attività formative in cui lo studente ha maturato i crediti con gli obiettivi formativi specifici del corso di studio e delle singole attività formative da riconoscere, perseguendo comunque la finalità di mobilità degli studenti.

Il riconoscimento è effettuato fino a concorrenza dei crediti formativi universitari previsti dall'ordinamento didattico del corso di studio.

Qualora, effettuati i riconoscimenti in base alle norme del presente regolamento, residuino crediti non utilizzati, il Consiglio di Corso di studio può riconoscerli valutando il caso concreto sulla base delle affinità didattiche e culturali.

Il riconoscimento è relativo ad insegnamenti impartiti o alle attività formative svolte in lingua inglese.

ART. 11 CRITERI DI RICONOSCIMENTO DELLE CONOSCENZE E ABILITÀ EXTRAUNIVERSITARIE

Possono essere riconosciute competenze acquisite fuori dall'Università nei seguenti casi:

1. conoscenze e abilità professionali certificate ai sensi della normativa vigente in materia o comunque adeguatamente certificate;

2. conoscenze e abilità maturate in attività formative di livello post secondario alla cui realizzazione e progettazione abbia concorso l'Università.

La richiesta di riconoscimento sarà valutata dal Consiglio di Corso di studio tenendo conto delle indicazioni date dagli Organi Accademici e del numero massimo di crediti riconoscibili fissato nell'ordinamento didattico del corso di studio.

Il riconoscimento potrà avvenire qualora l'attività sia coerente con gli obiettivi formativi specifici del corso di studio e delle attività formative che si riconoscono, visti anche il contenuto e la durata in ore dell'attività svolta.

ART. 12 TIROCINIO CURRICULARE

Il Corso di Studio, prevede un tirocinio curriculare finalizzato alla preparazione della tesi di laurea o comunque collegato ad un progetto formativo mirato ad affinare il suo processo di apprendimento e formazione da svolgersi secondo le procedure stabilite dal Regolamento generale tirocini di Ateneo e dai programmi internazionali di mobilità.

Tali esperienze formative della durata massima di 12 mesi, che dovranno concludersi entro la data del conseguimento del titolo di studio, potranno essere svolte prevedendo l'attribuzione di crediti formativi:

- nell'ambito di quelli attribuiti alla prova finale;

- per attività di tirocinio previsto dal piano didattico;

- per attività a scelta dello studente configurabili anche come tirocinio;

- per attività aggiuntive i cui crediti risultino oltre il numero previsto per il conseguimento del titolo di studio.

ART. 13 MODALITÀ DI SVOLGIMENTO DELLA PROVA FINALE

- **Caratteristiche della Prova finale**

La prova finale per il conseguimento della laurea magistrale consiste nella redazione e nella discussione pubblica di una tesi scritta in lingua inglese scritta ed elaborata in modo originale dallo studente su un argomento coerente con gli obiettivi del corso di studio, sotto la guida di un relatore che, di regola, è uno dei docenti del corso di studio.

La tesi di laurea magistrale in "Photochemistry and Molecular Materials" ha carattere originale e sperimentale e deve essere collegata a un progetto o a un tirocinio.

La dissertazione deve dimostrare la padronanza degli argomenti, capacità critica, l'attitudine a operare in modo autonomo e una capacità di comunicazione di buon livello.

- **Modalità di svolgimento della prova finale**

La prova finale è pubblica, e consiste nella presentazione, di fronte alla Commissione della prova finale, di una tesi redatta in lingua inglese e nella dissertazione sul lavoro svolto. La Commissione di laurea verifica la capacità del laureando di lavorare in modo autonomo e di esporre e discutere con chiarezza e piena padronanza i risultati del suo progetto di ricerca. La valutazione finale è espressa in centodecimi e comprende una valutazione complessiva del curriculum del laureando.

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La Commissione Paritetica docenti-studenti ha espresso parere favorevole sulla coerenza dei crediti assegnati alle singole attività formative e gli specifici obiettivi formativi programmati, ai sensi dell'articolo 12 comma 3 del DM 270/04.

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

TEACHING REGULATIONS OF THE MASTER DEGREE

LM-54 [PHOTOCHEMISTRY AND MOLECULAR MATERIALS]

Bologna Campus

INDEX

Second Cycle Degree Program in Photochemistry and Molecular Materials

ART. 1 ADMISSION REQUIREMENTS

- **<u>Entry requirements</u>**

Admission to the 2nd cycle degree program is subject to the possession of a 1st cycle degree, or other suitable qualification obtained abroad.

Moreover, admission to the 2nd cycle degree program is also subject to the possession of the following curricular requirements:

a) The possession of a 1st cycle degree in one of the following classes:

- ex D.M. 270:

 L-27 Chemical Sciences and Technologies

- ex. D.M. 509/99:

 L-21 Chemical Sciences and Technologies

- Previous degree program system (before D.M. 509/99): Degree in Chemistry or in Industrial Chemistry
- Any other degree obtained abroad that is recognized by the Second Cycle Degree Board as equivalent to the previously listed degrees.

b) If the degree obtained is different from the above-mentioned ones, the candidate should have obtained at least 60 CFU in basic scientific learnings (CHIM/01 to CHIM/12, BIO/10 - BIO/11, ING-ND/22 to ING-IND/27). A good basic knowledge of physical chemistry is also required: this knowledge will be evaluated mainly on the basis of the curriculum (1st cycle or five-year degree and programs) and on the content of the related courses.

c) Students with a foreign degree should possess a title that is recognized equivalent to those described in points a) and b). The evaluation will be conducted accordingly to procedures defined annually by the Board.

Admission to the master's degree programme is also subject to the assessment of students' personal knowledge which will take place according to the procedure defined in the paragraph "assessment of personal knowledge".

English language knowledge at B2 level (European classification) is required for the admission to the Degree programme.

- **Assessment of personal knowledge**

The assessment of the suitability of the personal knowledge will be carried out by the Admission Programme Board through the analysis of the curriculum which may be followed by an English interview, according to the methods, criteria and procedures established by the Degree Programme Board and published on the University website.

Knowledge of the English language at B2 level is required for the admission to the Degree Program.

Students who previously attended 1st cycle degree courses for which the official language of instruction is English, and English native speakers are exempt from presenting the certificate about English Language proficiency.

ART. 2 MOBILITY AMONG THE COURSE PATHS

The master's degree programme in Photochemistry and Molecular materials is divided into course paths.

Students may choose from the courses available in the course structure diagram, following the methods indicated in the structure itself and in the terms published on the University website.
Mobility among the course paths is allowed, following the deadlines published on the University website.

ART.3 INDIVIDUAL STUDY PLANS

Students will be allowed to present individual study plans according to the methods, deadlines and criteria published on Unibo web site. The individual study plans, approved by the Degree Programme Board, must be compliant with the teaching regulations and the guidelines defined by the competent bodies.
If students choose teaching activities that are activated in degree programmes with restricted access, the choice must also be authorized by the concerned Degree programme boards, based on criteria previously defined.

ART. 4 IMPLEMENTATION OF LEARNING ACTIVITIES AND TYPES OF TEACHING ACTIVITIES

The enclosed teaching plan indicates all the learning activities and their division into hours of classroom teaching, practical exercises, or internship, as well as the type of teaching methods.

Any further information will be published annually on the University website.

ART. 5 ATTENDANCE AND PREPARATORY ACTIVITIES

Compulsory attendance of teaching activities is indicated in the attached teaching plan, together with any preparatory activities involved in the individual learning activities.

The methods of compulsory attendance and any verification thereof are laid down annually in the study program during the presentation of the teaching plan and are notified to the students prior to the start of the program on the University website.

ART. 6 FLEXIBLE STUDY PLAN

Students can opt for flexible study plans, which allows to complete the 2nd cycle degree course in a longer or lesser time with respect to the normal number of years, according to the rules defined within the University Teaching Regulation.

The teaching activities of the study program can be replaced, in case of forced deactivation, by other activities, in order to guarantee quality and sustainability of the educational courses on offer.

ART. 7 ASSESSMENT OF LEARNING ACTIVITIES

The attached teaching plan indicates all cases in which the learning activities end with an exam, marked with a score out of 30, or by a simple “pass” when the necessary competencies have been acquired. The assessment methods are laid down annually by the Degree Program during the presentation of the teaching plan and notified to the students prior to start of the program on the University website.

ART. 8 ELECTIVE LEARNING ACTIVITIES

The Degree Programme Board considers all the learning activities defined by the Degree Programme Board and listed in the annexed Teaching Plan consistent with the teaching project.
If a student intends to attend one learning activity that is not included in the previewed list, she/he must submit a request to the Degree Programme Board within the deadlines and conditions published on UniBo web portal.

The Board shall verify the coherence of the request with the student’s own study plan.

ART. 9 CRITERIA FOR THE RECOGNITION OF CREDITS ACQUIRED IN DEGREE PROGRAMS IN THE SAME CLASS

The acquired university credits are recognized from a half up to the number of credits indicated for the same subject group laid down in the degree program teaching regulations, in compliance with the relative subject area and the type of learning activities.

If, after having evaluated and accepted the credits according to the provisions of this regulation, there remain unused residual credits, the Degree Programme Board may also accept their validity, after assessing each specific case on the basis of teaching and cultural affinities.

Recognition refers to course units delivered or learning activities undertaken in English.

ART. 10 CRITERIA FOR THE RECOGNITION OF CREDITS ACQUIRED WITHIN DEGREE PROGRAMS IN DIFFERENT CLASSES, FROM TELEMATIC UNIVERSITIES OR INTERNATIONAL DEGREE PROGRAMS

The acquired credits are recognized by the Degree Programme Board according to the following criteria:

- analysis of the course contents

- assessment of the coherence of the scientific-disciplinary fields and the contents of the learning activities

in which the student has acquired the credits with the specific learning outcomes of the study program and the individual learning activities to be recognized, in any case pursuing the aim of promoting student mobility.

The credits are recognized up to the maximum number of university credits provided for the program, as laid down in the degree program teaching regulations.

If, after having recognized the credits according to the provisions of this regulation, there are unused residual credits, the Degree Programme Board may recognize them by assessing the specific case in coherence with the teaching and cultural affinities.

Only teaching or training activities held in English may be recognized.

ART. 11 CRITERIA FOR THE RECOGNITION OF EXTRA-UNIVERSITY COMPETENCIES AND SKILLS

Competencies acquired outside the university may be recognized in the following cases:

- professional knowledge and skills certified under the terms of the applicable laws;

- competences and skills acquired in post-graduate learning activities run or planned by the University.

The request for recognition shall be assessed by the Degree Programme Board considering the indications of the academic bodies and the maximum number of recognizable credits laid down in the study program Teaching Regulations.
This recognition is subject to the activities being coherent with the specific learning outcomes of the study program and the learning activities which are recognized, also in consideration of the contents and duration in hours of the implemented activity.

ART.12 INTERNSHIP

The master's degree programme includes a compulsory internship for the purposes of preparing the dissertation or in any case linked to a project aiming to develop learning and academic skills.

The internship must be carried out in compliance with Unibo Training Regulations or International Mobility Programmes for Traineeships rules.
These learning experiences shall not exceed 12 months and shall be completed by the date of graduation; learning credits may be awarded for these activities:

- included in the quota for the final examination;

- for the internship activities laid down in the course structure diagram;

- for elective activities counting towards the internship;

- for additional activities if the number of credits exceeds the one required for graduation.

ART. 13 FINAL EXAMINATION

- **Final examination characteristics**

The Final examination consists in the preparation and public discussion of a dissertation written in English and prepared under the supervision of a tutor, who is usually a professor of the Degree Programme.
The thesis of the second cycle degree program in “Photochemistry and Molecular Materials” has original and experimental character and is linked to a project or an internship.

The dissertation shall demonstrate critical abilities and communication skills and provide elements of originality.

- **Final examination criteria**

The final examination is public and consists in the presentation, in front of a Final Examination Board, of a thesis written in English and in the discussion of the related experimental work.

The Board must ascertain the student ability to work independently, to describe and discuss clearly and autonomously the results obtained in the research project. The Board expresses its final assessment with a grade out of one hundred and ten, and comprises a general evaluation of the student's curriculum.

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The Faculty- Student Joint Committee gave a favorable opinion on the consistency of the credits assigned to each teaching activity and its learning outcomes pursuant to Art. 12, par. 3, of Ministerial Decree 270/04.

Anno Accademico **2024/2025**
Scuola **Scienze**
Classe **LM-54-SCIENZE CHIMICHE**
Corso **9074-PHOTOCHEMISTRY AND MOLECULAR MATERIALS**

CURRICULUM HEALTH (C36)

Primo Anno di Corso

Gruppo: Compulsory learning activities

TAF: **Ambito:**

Cfu min: **Cfu max:**
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
9074 000 000 98995 - 0 - BIOCONJUGATION AND RADICAL CHEMISTRY				10			Voto
Modulo integrato: 98996 - BIOCONJUGATE TECHNIQUES		CHIM/06		5	24/0/32/0	Si	
Ambito: 1237 - Discipline chimiche organiche			B				

Obiettivi: At the end of the course the student has acquired knowledge of the general strategies of synthesis, purification and characterization of bioconjugates and radical reactions that lead to the oxidation of organic and biological materials, the main mechanisms of antioxidant action and the relationship between structure and antioxidant activity.

Obiettivi inglese: At the end of the course the student has acquired knowledge of the general strategies of synthesis, purification and characterization of bioconjugates and radical reactions that lead to the oxidation of organic and biological materials, the main mechanisms of antioxidant action and the relationship between structure and antioxidant activity.

Modulo integrato: B2008 - PHYSICAL ORGANIC CHEMISTRY		CHIM/06		5	40/0/0/0	Si	
Ambito: 1237 - Discipline chimiche organiche			B				

Obiettivi: At the end of the course the student has acquired knowledge of the general strategies of synthesis, purification and characterization of bioconjugates and radical reactions that lead to the oxidation of organic and biological materials, the main mechanisms of antioxidant action and the relationship between structure and antioxidant activity.

Obiettivi inglese: At the end of the course the student has acquired knowledge of the general strategies of synthesis, purification and characterization of bioconjugates and radical reactions that lead to the oxidation of organic and biological materials, the main mechanisms of antioxidant action and the relationship between structure and antioxidant activity.

9074 000 000 98990 - 0 - BIOMIMETIC MATERIALS	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge to design, develop and characterize inorganic and organic-inorganic materials with tailored technological properties, according to the biomimetic principles, such as synthesis in confined reaction spaces, templated synthesis, morphosynthesis, crystal tectonics.

Obiettivi inglese: At the end of the course the student has acquired knowledge to design, develop and characterize inorganic and organic-inorganic materials with tailored technological properties, according to the biomimetic principles, such as synthesis in confined reaction spaces, templated synthesis, morphosynthesis, crystal tectonics.

9074 000 000 98991 - 0 - COMPUTATIONAL METHODOLOGY AND STATISTICAL ANALYSIS		8			Voto
Modulo integrato: 98992 - COMPUTATIONAL METHODOLOGY	CHIM/02	5	24/0/32/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired theoretical and computational approaches to study the properties of health related materials, including complex molecular architectures and the basic concepts of probability distributions, and statistical tools used in treating experimental data and tackle biological intrinsic variability.

Obiettivi inglese: At the end of the course the student has acquired theoretical and computational approaches to study the properties of health related materials, including complex molecular architectures and the basic concepts of probability distributions, and statistical tools used in treating experimental data and tackle biological intrinsic variability.

Modulo integrato: 98993 - STATISTICAL ANALYSIS	CHIM/02	3	16/12/0/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired theoretical and computational approaches to study the properties of health related materials, including complex molecular architectures and the basic concepts of probability distributions, and statistical tools used in treating experimental data and tackle biological intrinsic variability.

Obiettivi inglese: At the end of the course the student has acquired theoretical and computational approaches to study the properties of health related materials, including complex molecular architectures and the basic concepts of probability distributions, and statistical tools used in treating experimental data and tackle biological intrinsic variability.

9074 000 000 98672 - 0 - CRYSTAL ENGINEERING	CHIM/03	6	40/0/16/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge to design, prepare and characterize crystalline molecular materials and coordination networks and to study crystal polymorphs and co-crystals.

Obiettivi inglese: At the end of the course the student has acquired knowledge to design, prepare and characterize crystalline molecular materials and coordination networks and to study crystal polymorphs and co-crystals.

9074 000 000 91208 - 0 - FUNCTIONAL POLYMERIC MATERIALS	CHIM/04	6	40/0/16/0	Si	Voto

Ambito: 351 - Discipline chimiche industriali B

Obiettivi: At the end of the course the student has acquired knowledge on structure-property relationships of polymeric materials designed to perform specific functions. The student will be able to identify the elements of the macromolecular chemical structure that influence the requested functionality, as well as the structural and morphological parameters that influence the final properties of the material.

Obiettivi inglese: At the end of the course the student has acquired knowledge on structure-property relationships of polymeric materials designed to perform specific functions. The student will be able to identify the elements of the macromolecular chemical structure that influence the requested functionality, as well as the structural and morphological parameters that influence the final properties of the material.

9074 000 000 99153 - 0 - MOLECULAR AND SUPRAMOLECULAR PHOTOCHEMISTRY (8 CFU)	CHIM/03	8	64/0/0/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge to analyze photoinduced intra- and intermolecular processes and to design photoactive molecular and supramolecular systems with applications for energy conversion, smart materials and luminescent biosensors.

Obiettivi inglese: At the end of the course the student has acquired knowledge to analyze photoinduced intra- and intermolecular processes and to design photoactive molecular and supramolecular systems with applications for energy conversion, smart materials and luminescent biosensors.

9074 000 000 98673 - 0 - PHYSICAL CHEMISTRY: CHEMICAL AND ELECTROCHEMICAL PROPERTIES (C.I.) 12 Voto

Modulo integrato: 91207 - MOLECULAR ELECTROCHEMISTRY CHIM/02 6 32/12/32/0 No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired the theoretical and experimental basis for the comprehension and investigation of the physical-chemical processes associated to electron transfer processes, either heterogeneous or homogeneous and intramolecular.

Obiettivi inglese: At the end of the course the student has acquired the theoretical and experimental basis for the comprehension and investigation of the physical-chemical processes associated to electron transfer processes, either heterogeneous or homogeneous and intramolecular.

Modulo integrato: 91909 - PROPERTIES AND PROCESSES IN THE CONDENSED PHASE CHIM/02 6 24/24/16/0 No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge necessary to bridge molecular, surface and solid state properties and to investigate also dynamical aspects of matter.

Obiettivi inglese: At the end of the course the student has acquired knowledge necessary to bridge molecular, surface and solid state properties and to investigate also dynamical aspects of matter.

9074 000 000 98994 - 0 - PROCESSES OF CELL MATTER CHIM/02 6 40/0/16/0 No Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge on i) the physico-chemical principles governing physiological and pathological cellular processes and driving biological macromolecule activities; ii) cellular processes that can be targeted for specific drug delivery and tissue and organ engineering.

Obiettivi inglese: At the end of the course the student has acquired knowledge on i) the physico-chemical principles governing physiological and pathological cellular processes and driving biological macromolecule activities; ii) cellular processes that can be targeted for specific drug delivery and tissue and organ engineering.

Secondo Anno di Corso

Gruppo: Compulsory learning activities

TAF: Ambito:

Cfu min: Cfu max:

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
9074 000 000 86228 - 0 - FINAL EXAMINATION				1	0/0/0/0	No	

Ambito: 1018 - Per la prova finale E

Obiettivi: At the end of the activity, the student has acquired the competencies to write and publicly discuss a dissertation in English. The student will gain critical capabilities, communication skills and the ability to describe and discuss clearly and autonomously the results obtained in the research project.

Obiettivi inglese: At the end of the activity, the student has acquired the competencies to write and publicly discuss a dissertation in English. The student will gain critical capabilities, communication skills and the ability to describe and discuss clearly and autonomously the results obtained in the research project.

Note: The activity does not imply your continuous presence in Unibo premises nor at external companies/institutions.

9074 000 000 91994 - 0 - FRONTIERS IN SCIENCE 3 18/0/0/0 No Giudizio

Ambito: 1147 - Altre conoscenze utili per l'inserimento nel mondo del lavoro F

Obiettivi: At the end of the course the student has been exposed to the most recent results and developments in chemistry and science, and has been given the opportunity of interacting with scientists from all over the world. He has a broad perspective of scientific open issues and is aware of state-of-the-art problems, solutions and applications in a scientific context.

Obiettivi inglese: At the end of the course the student has been exposed to the most recent results and developments in chemistry and science, and has been given the opportunity of interacting with scientists from all over the world. He has a broad perspective of scientific open issues and is aware of state-of-the-art problems, solutions and applications in a scientific context.

9074 000 000 98714 - 0 - INTERNSHIP FOR PREPARATION FOR THE FINAL EXAMINATION (20 CFU) 20 250/0/0/0 No Voto

Ambito: 1018 - Per la prova finale E

Obiettivi: At the end of the activity, the student has developed an original scientific project at a research laboratory of either a public or private institution, working in the field of photochemistry and molecular materials, acquiring data for the dissertation and final examination. The student will acquire the competencies to work independently, carry out experimental investigations by means of synthetic, characterization and/or computational tools, and make operational proposals, both from an experimental and theoretical point of view, to increase the knowledge on the topic under investigation.

Obiettivi inglese: At the end of the activity, the student has developed an original scientific project at a research laboratory of either a public or private institution, working in the field of photochemistry and molecular materials, acquiring data for the dissertation and final examination. The student will acquire the competencies to work independently, carry out experimental investigations by means of synthetic, characterization and/or computational tools, and make operational proposals, both from an experimental and theoretical point of view, to increase the knowledge on the topic under investigation.

Note: With this activity, you start an internship by applying on SOL – Internship (to know more go on your degree course's website > homepage > studying>internship for the preparation of the final thesis.

9074 000 000 99113 - 0 - NANOMEDICINE AND LIGHT-RESPONSIVE MATERIALS 10 Voto

Modulo integrato: 91241 - NANOMEDICINE CHIM/03 5 40/0/0/0 No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired the knowledge for the design of contrast agents for the most common imaging techniques and of possible drug delivery systems, with a critical approach to nanomedicine, the knowledge of kinetic and thermodynamic stability of colloidal systems and stimuli-responsive materials, as well as of the main photochemical techniques used to investigate them.

Obiettivi inglese: At the end of the course the student has acquired the knowledge for the design of contrast agents for the most common imaging techniques and of possible drug delivery systems, with a critical approach to nanomedicine, the knowledge of kinetic and thermodynamic stability of colloidal systems and stimuli-responsive materials, as well as of the main photochemical techniques used to investigate them.

Modulo integrato: 99114 - SOFT AND LIGHT -RESPONSIVE MATERIALS CHIM/03 5 24/0/32/0 No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired the knowledge for the design of contrast agents for the most common imaging techniques and of possible drug delivery systems, with a critical approach to nanomedicine, the knowledge of kinetic and thermodynamic stability of colloidal systems and stimuli-responsive materials, as well as of the main photochemical techniques used to investigate them.

Obiettivi inglese: At the end of the course the student has acquired the knowledge for the design of contrast agents for the most common imaging techniques and of possible drug delivery systems, with a critical approach to nanomedicine, the knowledge of kinetic and thermodynamic stability of colloidal systems and stimuli-responsive materials, as well as of the main photochemical techniques used to investigate them.

Gruppo: Elective learning activities

TAF: C Ambito: 1144 - Attivita' formative affini o integrative

Cfu min: 12 Cfu max: 12

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

9074 000 000 99126 - 0 - APPLIED BIOMATERIALS	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired basic knowledge of bone and articular tissue, biomaterials commonly used for the bone tissue regeneration and for bone implants.

Obiettivi inglese: At the end of the course the student has acquired basic knowledge of bone and articular tissue, biomaterials commonly used for the bone tissue regeneration and for bone implants.

9074 000 000 99127 - 0 - BIOMIMETIC SUPRAMOLECULAR CHEMISTRY	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired knowledge of the properties and transformations of the main classes of supramolecular systems, the biomimetic approach to their design and application, the main techniques used for their characterization.

Obiettivi inglese: At the end of the course the student has acquired knowledge of the properties and transformations of the main classes of supramolecular systems, the biomimetic approach to their design and application, the main techniques used for their characterization.

9074 000 000 99124 - 0 - DIAGNOSTIC AND MICROFABRICATION TECHNIQUES FOR HEALTHCARE	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired knowledge on: i) the advanced techniques for the investigation of cell/material interfaces; ii) the signal transduction strategies, which are based on physico-chemical and electrochemical principles, employed in the clinical diagnosis; iii) nano-microfabrication tools and surface modification routes used in healthcare sensors and medical devices.

Obiettivi inglese: At the end of the course the student has acquired knowledge on: i) the advanced techniques for the investigation of cell/material interfaces; ii) the signal transduction strategies, which are based on physico-chemical and electrochemical principles, employed in the clinical diagnosis; iii) nano-microfabrication tools and surface modification routes used in healthcare sensors and medical devices.

9074 000 000 91243 - 0 - PHOTOBIOPHYSICS AND PHOTOBIOLOGY	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired an interdisciplinary basis for the study of photobiological processes at the molecular level, with special emphasis on photosynthesis and photoreception.

Obiettivi inglese: At the end of the course the student has acquired an interdisciplinary basis for the study of photobiological processes at the molecular level, with special emphasis on photosynthesis and photoreception.

9074 000 000 91237 - 0 - POLYMERIC MATERIALS FOR LIFE SCIENCE	CHIM/04	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of this Course the student will have a deep knowledge of the properties of the main polymeric materials that are used in the biomedical and pharmaceutical field. In particular the student will gain basic knowledge regarding the principles of biocompatibility and biodegradability of the polymeric materials that are used for regenerative medicine and drug release applications.

Obiettivi inglese: At the end of this Course the student will have a deep knowledge of the properties of the main polymeric materials that are used in the biomedical and pharmaceutical field. In particular the student will gain basic knowledge regarding the principles of biocompatibility and biodegradability of the polymeric materials that are used for regenerative medicine and drug release applications.

9074 000 000 B5462 - 0 - PREBIOTIC CHEMISTRY IN THE EARLY UNIVERSE	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired a deep knowledge of the chemistry occurring in space in connection with the formation of prebiotic molecules, as well as the principles and the techniques for the discovery of molecules in space and the theories at the basis of the origin of life on Earth.

Obiettivi inglese: At the end of the course the student has acquired a deep knowledge of the chemistry occurring in space in connection with the formation of prebiotic molecules, as well as the principles and the techniques for the discovery of molecules in space and the theories at the basis of the origin of life on Earth.

Gruppo: Free Choice learning activities

TAF: D Ambito: 1008 - A scelta dello studente

Cfu min: 12 Cfu max: 12

Num. Esami: 1 Num. Idoneità: 0
Il Dipartimento garantisce che, ai fini del rispetto del limite massimo di 12 esami/5 idoneità i CFU a scelta saranno acquisibili con 1 esami e 0 idoneità

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

Anno Accademico **2024/2025**
Scuola **Scienze**
Classe **LM-54-SCIENZE CHIMICHE**
Corso **9074-PHOTOCHEMISTRY AND MOLECULAR MATERIALS**

CURRICULUM ENERGY (C35)

Primo Anno di Corso

Gruppo: Compulsory learning activities

TAF: **Ambito:**

Cfu min: **Cfu max:**
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
9074 000 000 98672 - 0 - CRYSTAL ENGINEERING		CHIM/03		6	40/0/16/0	No	Voto
Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche			B				
Obiettivi: At the end of the course the student has acquired knowledge to design, prepare and characterize crystalline molecular materials and coordination networks and to study crystal polymorphs and co-crystals.							
Obiettivi inglese: At the end of the course the student has acquired knowledge to design, prepare and characterize crystalline molecular materials and coordination networks and to study crystal polymorphs and co-crystals.							
9074 000 000 91208 - 0 - FUNCTIONAL POLYMERIC MATERIALS		CHIM/04		6	40/0/16/0	Si	Voto
Ambito: 351 - Discipline chimiche industriali			B				
Obiettivi: At the end of the course the student has acquired knowledge on structure-property relationships of polymeric materials designed to perform specific functions. The student will be able to identify the elements of the macromolecular chemical structure that influence the requested functionality, as well as the structural and morphological parameters that influence the final properties of the material.							
Obiettivi inglese: At the end of the course the student has acquired knowledge on structure-property relationships of polymeric materials designed to perform specific functions. The student will be able to identify the elements of the macromolecular chemical structure that influence the requested functionality, as well as the structural and morphological parameters that influence the final properties of the material.							
9074 000 000 91224 - 0 - MATERIALS ORGANIC CHEMISTRY WITH LABORATORY		CHIM/06		6	32/0/32/0	Si	Voto
Ambito: 1237 - Discipline chimiche organiche			B				
Obiettivi: At the end of the course the student has acquired knowledges towards the design and synthesis of conjugated organic compounds and laboratory experience of multi-step synthesis and analytical/spectroscopic characterization of conjugated organic molecular materials.							
Obiettivi inglese: At the end of the course the student has acquired knowledges towards the design and synthesis of conjugated organic compounds and laboratory experience of multi-step synthesis and analytical/spectroscopic characterization of conjugated organic molecular materials.							

9074 000 000 99153 - 0 - MOLECULAR AND SUPRAMOLECULAR PHOTOCHEMISTRY (8 CFU)	CHIM/03	8	64/0/0/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired knowledge to analyze photoinduced intra- and intermolecular processes and to design photoactive molecular and supramolecular systems with applications for energy conversion, smart materials and luminescent biosensors.

Obiettivi inglese: At the end of the course the student has acquired knowledge to analyze photoinduced intra- and intermolecular processes and to design photoactive molecular and supramolecular systems with applications for energy conversion, smart materials and luminescent biosensors.

9074 000 000 91910 - 0 - MOLECULAR MATERIALS: PROPERTIES AND MODELLING	CHIM/02	6	32/12/16/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course, the student has acquired knowledge of the main computational techniques useful for the study of molecules and aggregates in their ground and excited states and for the study of static and dynamic properties of molecular materials.

Obiettivi inglese: At the end of the course, the student has acquired knowledge of the main computational techniques useful for the study of molecules and aggregates in their ground and excited states and for the study of static and dynamic properties of molecular materials.

9074 000 000 98678 - 0 - MOLECULAR NANOTECHNOLOGY	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired the basic concepts and the main strategies for the bottom-up construction of functional nanostructures, starting from molecules and using the paradigms of supramolecular chemistry: molecular devices and machines, dendrimers, nanoparticles, self-assembled monolayers and thin films.

Obiettivi inglese: At the end of the course the student has acquired the basic concepts and the main strategies for the bottom-up construction of functional nanostructures, starting from molecules and using the paradigms of supramolecular chemistry: molecular devices and machines, dendrimers, nanoparticles, self-assembled monolayers and thin films.

9074 000 000 98675 - 0 - PHOTOACTIVE MATERIALS AND TECHNIQUES FOR ENERGY CONVERSION		10			Voto
Modulo integrato: 98676 - PHOTOACTIVE MATERIALS FOR ENERGY CONVERSION	CHIM/03	6	48/0/0/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course, the student has acquired knowledge of the advanced methodologies and applications in the fields of lighting (LED and OLED), solar energy conversion and storage, photocatalysis and on the working principles and use of the simplest photochemical techniques both in steady-state and time-resolved regime.

Obiettivi inglese: At the end of the course, the student has acquired knowledge of the advanced methodologies and applications in the fields of lighting (LED and OLED), solar energy conversion and storage, photocatalysis and on the working principles and use of the simplest photochemical techniques both in steady-state and time-resolved regime.

Modulo integrato: 98677 - PHOTOCHEMISTRY LABORATORY	CHIM/03	4	16/0/32/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course, the student has acquired knowledge of the advanced methodologies and applications in the fields of lighting (LED and OLED), solar energy conversion and storage, photocatalysis and on the working principles and use of the simplest photochemical techniques both in steady-state and time-resolved regime.

Obiettivi inglese: At the end of the course, the student has acquired knowledge of the advanced methodologies and applications in the fields of lighting (LED and OLED), solar energy conversion and storage, photocatalysis and on the working principles and use of the simplest photochemical techniques both in steady-state and time-resolved regime.

9074 000 000 98673 - 0 - PHYSICAL CHEMISTRY: CHEMICAL AND ELECTROCHEMICAL PROPERTIES (C.I.)		12			Voto
Modulo integrato: 91207 - MOLECULAR ELECTROCHEMISTRY	CHIM/02	6	32/12/32/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche B

Obiettivi: At the end of the course the student has acquired the theoretical and experimental basis for the comprehension and investigation of the physical-chemical processes associated to electron transfer processes, either heterogeneous or homogeneous and intramolecular.

Obiettivi inglese: At the end of the course the student has acquired the theoretical and experimental basis for the comprehension and investigation of the physical-chemical processes associated to electron transfer processes, either heterogeneous or homogeneous and intramolecular.

Modulo integrato: 91909 - PROPERTIES AND PROCESSES IN THE CONDENSED PHASE | CHIM/02 | 6 | 24/24/16/0 | No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche | B

Obiettivi: At the end of the course the student has acquired knowledge necessary to bridge molecular, surface and solid state properties and to investigate also dynamical aspects of matter.

Obiettivi inglese: At the end of the course the student has acquired knowledge necessary to bridge molecular, surface and solid state properties and to investigate also dynamical aspects of matter.

Secondo Anno di Corso

Gruppo: Compulsory learning activities

TAF: Ambito:

Cfu min: Cfu max:

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
9074 000 000 98682 - 0 - APPLIED PHYSICAL CHEMISTRY (C.I.)				12			Voto
Modulo integrato: 98683 - LASERS		CHIM/02		6	32/12/16/0	No	

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche | B

Obiettivi: At the end of the course the student has acquired the basic principles of laser operation, knowledge of their optical properties and the chemical applications of the main commercially available laser sources.

Obiettivi inglese: At the end of the course the student has acquired the basic principles of laser operation, knowledge of their optical properties and the chemical applications of the main commercially available laser sources.

Modulo integrato: 91238 - ELECTROCHEMICAL SYSTEMS FOR ENERGY STORAGE AND CONVERSION | CHIM/02 | 6 | 40/0/16/0 | No

Ambito: 1236 - Discipline chimiche inorganiche e chimico-fisiche | B

Obiettivi: At the end of the course the student has acquired basic and technological knowledge of the most advanced materials for energy storage and/or conversion systems (lithium batteries, supercapacitors and fuel cells) and main electrochemical techniques for testing and characterization of materials and devices.

Obiettivi inglese: At the end of the course the student has acquired basic and technological knowledge of the most advanced materials for energy storage and/or conversion systems (lithium batteries, supercapacitors and fuel cells) and main electrochemical techniques for testing and characterization of materials and devices.

9074 000 000 86228 - 0 - FINAL EXAMINATION | 1 | 0/0/0/0 | No

Ambito: 1018 - Per la prova finale | E

Obiettivi: At the end of the activity, the student has acquired the competencies to write and publicly discuss a dissertation in English. The student will gain critical capabilities, communication skills and the ability to describe and discuss clearly and autonomously the results obtained in the research project.

Obiettivi inglese: At the end of the activity, the student has acquired the competencies to write and publicly discuss a dissertation in English. The student will gain critical capabilities, communication skills and the ability to describe and discuss clearly and autonomously the results obtained in the research project.

Note: The activity does not imply your continuous presence in Unibo premises nor at external companies/institutions.

9074 000 000 91994 - 0 - FRONTIERS IN SCIENCE		3	18/0/0/0	No	Giudizio

Ambito: 1147 - Altre conoscenze utili per l'inserimento nel mondo del lavoro F

Obiettivi: At the end of the course the student has been exposed to the most recent results and developments in chemistry and science, and has been given the opportunity of interacting with scientists from all over the world. He has a broad perspective of scientific open issues and is aware of state-of-the-art problems, solutions and applications in a scientific context.

Obiettivi inglese: At the end of the course the student has been exposed to the most recent results and developments in chemistry and science, and has been given the opportunity of interacting with scientists from all over the world. He has a broad perspective of scientific open issues and is aware of state-of-the-art problems, solutions and applications in a scientific context.

9074 000 000 98714 - 0 - INTERNSHIP FOR PREPARATION FOR THE FINAL EXAMINATION (20 CFU)		20	250/0/0/0	No	Voto

Ambito: 1018 - Per la prova finale E

Obiettivi: At the end of the activity, the student has developed an original scientific project at a research laboratory of either a public or private institution, working in the field of photochemistry and molecular materials, acquiring data for the dissertation and final examination. The student will acquire the competencies to work independently, carry out experimental investigations by means of synthetic, characterization and/or computational tools, and make operational proposals, both from an experimental and theoretical point of view, to increase the knowledge on the topic under investigation.

Obiettivi inglese: At the end of the activity, the student has developed an original scientific project at a research laboratory of either a public or private institution, working in the field of photochemistry and molecular materials, acquiring data for the dissertation and final examination. The student will acquire the competencies to work independently, carry out experimental investigations by means of synthetic, characterization and/or computational tools, and make operational proposals, both from an experimental and theoretical point of view, to increase the knowledge on the topic under investigation.

Note: With this activity, you start an internship by applying on SOL – Internship (to know more go on your degree course's website > homepage > studying>internship for the preparation of the final thesis.

Gruppo: Elective learning activities

TAF: C Ambito: 1144 - Attivita' formative affini o integrative

Cfu min: 12 Cfu max: 12

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
9074 000 000 97475 - 0 - ADVANCED ORGANIC SYNTHESIS FOR FUNCTIONAL MATERIALS		CHIM/06		6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired the theoretical basis necessary to design and undertake the synthesis of principal molecular building blocks used in optoelectronics, the covalent fucntionalization of carbon nanoforms, sustainable C-H activation protocols, visible-light photo- and carbocatalysis.

Obiettivi inglese: At the end of the course the student has acquired the theoretical basis necessary to design and undertake the synthesis of principal molecular building blocks used in optoelectronics, the covalent fucntionalization of carbon nanoforms, sustainable C-H activation protocols, visible-light photo- and carbocatalysis.

9074 000 000 99129 - 0 - ELECTRONIC AND OPTICAL MICROSCOPY		CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired knowledge of the most common electronic and optical microscopies used for the characterisation of materials and biomolecules and the analysis of the acquired images.

Obiettivi inglese: At the end of the course the student has acquired knowledge of the most common electronic and optical microscopies used for the characterisation of materials and biomolecules and the analysis of the acquired images.

9074 000 000 98716 - 0 - ENVIRONMENTAL PHOTOCHEMISTRY AND PHOTOPROTECTION	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired the basic principles and conventional techniques used for environment-related photoprocesses, such as air purification and water treatment/disinfection, as well as photoprotection of materials and living organisms.

Obiettivi inglese: At the end of the course the student has acquired the basic principles and conventional techniques used for environment-related photoprocesses, such as air purification and water treatment/disinfection, as well as photoprotection of materials and living organisms.

9074 000 000 91239 - 0 - MATERIALS SPECTROSCOPY	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course, the student has acquired the fundamentals of materials spectroscopy, quantum theory of solids, as well as spectroscopic techniques based on absorption/emission, light scattering, and magnetic properties.

Obiettivi inglese: At the end of the course, the student has acquired the fundamentals of materials spectroscopy, quantum theory of solids, as well as spectroscopic techniques based on absorption/emission, light scattering, and magnetic properties.

9074 000 000 B2435 - 0 - MECHANOCHEMISTRY	CHIM/03	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired knowledge of (i) mechanochemical synthesis of organic and metallorganic materials, (ii) techniques for in-situ reaction monitoring, and (iii) sustainable processes alternative to traditional solution methods.

Obiettivi inglese: At the end of the course the student has acquired knowledge of (i) mechanochemical synthesis of organic and metallorganic materials, (ii) techniques for in-situ reaction monitoring, and (iii) sustainable processes alternative to traditional solution methods.

9074 000 000 91236 - 0 - ORGANIC ELECTRONICS: MATERIALS AND APPLICATIONS	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the of the course the student has acquired the basic knowledge for studying the electronic and photonic processes involved in molecular solids, as well as some basics on organic materials and organic electronic devices.

Obiettivi inglese: At the of the course the student has acquired the basic knowledge for studying the electronic and photonic processes involved in molecular solids, as well as some basics on organic materials and organic electronic devices.

9074 000 000 97510 - 0 - POLYMERS FOR ENERGY AND ADVANCED APPLICATIONS	CHIM/04	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired the knowledge for the comprehension of the structure-property correlations in polymeric materials to achieve stimuli responsiveness and the knowledge of the most important classes of polymeric materials used for energy storage, energy conversion and for advanced applications.

Obiettivi inglese: At the end of the course the student has acquired the knowledge for the comprehension of the structure-property correlations in polymeric materials to achieve stimuli responsiveness and the knowledge of the most important classes of polymeric materials used for energy storage, energy conversion and for advanced applications.

9074 000 000 98715 - 0 - STATISTICAL TREATMENT OF EXPERIMENTAL DATA	CHIM/02	6	48/0/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: At the end of the course the student has acquired the basic concepts of probability distributions, statistical tools used in treating experimental data, fluctuation analysis and classification of noise sources.

Obiettivi inglese: At the end of the course the student has acquired the basic concepts of probability distributions, statistical tools used in treating experimental data, fluctuation analysis and classification of noise sources.

Gruppo: Free Choice learning activities

TAF: D Ambito: 1008 - A scelta dello studente

Cfu min: 12 Cfu max: 12

Num. Esami: 1 Num. Idoneità: 0
Il Dipartimento garantisce che, ai fini del rispetto del limite massimo di 12 esami/5 idoneità i CFU a scelta saranno acquisibili con 1 esami e 0 idoneità

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

Legenda:

CFU: crediti formativi universitari
TAF: tipologia attività formativa (A-di base; B-caratterizzanti; C-affini o integrative; F-ulteriori attività formative; D-a scelta autonoma dello studente; S- stages e tirocini presso imprese, enti pubblici o privati, ordini professionali; E-per la prova finale)
SSD: settore scientifico disciplinare
F/E/L/N: indica le ore Frontali/Esercitazioni/Laboratori/Ore di esercitazione e/o laboratorio tenute da non docenti
Freq.: segnala l'esistenza di un obbligo di frequenza
Ver.: indica la modalità di verifica del profitto finale
TIP.: indica la tipologia delle forme didattiche. Queste possono essere CON: convenzionali, E-L: in e-learning, MIX: miste, C/E: convenzionali e/o e-learning. Il corso di studio può definire annualmente una delle modalità.