PhD School - Politecnico di Milano

Regulations of the PhD Programme in:

MATERIALS ENGINEERING

Cycle XXXIV
1. General Information

PhD School - Politecnico di Milano

PhD Programme: Materials Engineering

Course start: November 2018

Location of the PhD Programme: Milano Leonardo/Bovisa

Promoter Department: Dipartimento di Chimica, Materiali e Ingegneria Chimica Giulio Natta

Scientific Disciplinary Sectors

- ING/IND 22 (09D1): Scienza e Tecnologia dei Materiali (“Materials Science and Technology”) (50%)
- ING/IND 21 (09D1): Metallurgia (“Metallurgy”) (10%)
- ING-IND/23 (09D2): Chimica Fisica Applicata (“Applied Physical Chemistry”) (5%)
- FIS-03 (02) Fisica della Materia (“Physics of matter”) (15%)
- CHIM-07 (03): Fondamenti Chimici delle Tecnologie (“Chemical Foundations of Technologies”) (15%)
- ING/IND-34 (09G2): Bioingegneria Industriale (“Industrial Bioengineering”) (5%)

PhD School Website: [http://www.polimi.it/phd](http://www.polimi.it/phd)

2. General presentation

The Ph.D Programme in Materials Engineering aims at training Ph.D laureates in Materials Engineering having a common background and specialized qualifications in advanced research areas.

Materials Engineering involves the knowledge of correlation among materials structure, processing and functional and structural properties, and its exploitation in materials application to final application. The target is to combine theoretical knowledge, experimental abilities and technological expertise to shape proactive professionals skilled in the design, production and application of both traditional and innovative materials and their optimization for specific technological applications.

Training consists of a three-year programme and requires acquisition of 180 credits, 25 of which obtained by attending PhD level courses. PhD Courses provide both a fundamental background and a specialized qualification.

Some of the research topics and courses are offered in the scope of traditional classification into material classes, whereas other focus on material structure at the nanometric scale or on structure/property correlation over several time and length-scales. Finally, a set of topics are offered in which materials are considered in view of their use in several industrial fields and applications.

These topics include, but are not limited to:

- Biomaterials
- Polymers
- Metallic Materials
- Composites
- Concrete Materials
- Ceramic Materials
- Nanostructured Materials
- Smart, responsive and self-healing materials
- Coatings and surface functionalization
- Structure, properties and microscopic theories for materials
- Materials corrosion and durability
- Materials processing
- Materials for electronics, photonics and sensing
- Materials for design
- Materials for the conservation of cultural heritage
- Materials for energy
- Materials for the environment
- Materials for packaging

The PhD course is run by a Coordinator and a Faculty Board.

The Coordinator chairs the Faculty Board, coordinates the preparation of the annual Educational
Programme and organises the general educational activities of the PhD course (see Attachment A1).

The Faculty Board is responsible for the Educational programme, for supervision of the the PhD students research, and for teaching and administrative activities related to the PhD course (see Attachment A2).

PhD Course in Materials Engineering received the appraisal of “Innovative PhD Course” by the Italian Ministry of Education, Universities and Research.

3. Objectives

The objective of the PhD Course in Materials Engineering is to educate proactive professionals aware of the correlation between the materials structure over several length-scales, the effects of processing on structure, and the final properties in use. This knowledge makes them skilled in the design, production and application of both traditional and innovative materials, their optimization for specific applications and the prediction and assessment of their performance. From the list of topics reported in the general presentation, these skills may be acquired in several fields related to materials, all requiring the same multidisciplinary approach.

4. Professional opportunities and job market

The manufacturing industry is strongly linked to materials and seeks answers to two general types of problem, to which Materials Engineering can contribute significantly. First of all, the manufacturing industry is constantly seeking innovation in the production, processing, application and conservation of traditional materials. Secondly, there is always scope for innovative materials allowing radically new, currently unforeseeable applications.

The knowledge and skills of a PhD in Materials Engineering enables graduates to pursue their career in the Manufacturing industry given its quest for innovation in the production, processing, application and conservation of traditional materials and for the introduction of innovative materials allowing radically new, currently unforeseeable applications.

Finally, the background deriving from full-time activity both in research and in education also qualifies the PhD candidate for an academic career. Several former graduates from the Materials Engineering Programme have been able to secure post-doctoral research positions at respected universities and research institutes.
5. Enrolment

5.1 Admission requirements

Italian and International citizens can apply. They are requested to have graduated in accordance with the pre-existing laws D.M. 3.11.1999 n. 509, or to have a Master of Science degree in accordance with D.M. 3.11.1999 n. 509, or a Master of Science in accordance with D.M. 22.10.2004 n. 270, or similar academic title obtained abroad, equivalent for duration and content to the Italian title, with an overall duration of university studies of at least five years.

The certified knowledge of the English language is a requirement for admission. Please refer to the PhD School website for details.

The admission to the programmes will be established according to the evaluation of the candidates' curricula, motivation letters, and an illustrative report about the development of a possible PhD research, which candidates will send contextually with their application to the admission announcement.

5.2 Admission deadlines and number of vacancies

The number of positions is indicated in the Call for admission to the 34th PhD cycle Programmes: http://www.polimi.it/phd

Scholarships both on general and on specific themes are available, in accordance with what is specified in the call for admission.

6. Contents

6.1 Requirements for the PhD title achievement

The achievement of the PhD title in Materials Engineering requires an activity of at least three years equivalent of full time study, research and development of PhD thesis.

PhD candidates in Materials Engineering must earn a minimum of 25 course credits (see paragraph 6.3 below), and to continuously carry out studies and research.

At the beginning of the course, the Faculty Board assigns a tutor to each PhD candidate to supervise and assist him/her in the overall training program. The tutor shall be a professor belonging to the Faculty Board. The tutors assist the candidates in the choice of courses to be included in the study plan, which is eventually submitted for approval to the Coordinator of the PhD Programme (see also section 6.4 below).

The Faculty Board may assign extra course credits to one or more candidates, in case they need to complete their preparation in specific topics, relevant for their research projects.
6.2 Research development

The main aim of all Politecnico di Milano PhD Programmes is the development in the candidates of a research-oriented mind-set, with expertise and skills in a specific research topic. To this end, candidates develop a problem-solving capability in complex contexts, including the capacity of performing deep problem analysis, identifying original solutions, and evaluating their applicability in practical contexts.

These skills provide the PhD candidates with major opportunities of development in their research both in the academic field, and in public and private organizations.

PhD candidates are requested to develop an original research contribution. The PhD thesis must thus contribute to increase the knowledge in the candidate's research field. Besides, it has to be coherent with the research topics developed in the Department where the PhD Programme is carried out.

The original research results are collected in the PhD thesis, where the candidate's contribution is put in perspective with respect to the research state of the art in the specific research field.

The PhD research is developed under the guidance of a supervisor, who supports the candidate in the setting-out and in the everyday activities related to the thesis development. The supervisor is not necessarily a member of the Faculty Board and may also belong to an institution different from Politecnico di Milano. The supervisor can be supported by one or more co-supervisors.

Further activities intended to develop the candidate's personal skills and research expertise are encouraged during the PhD path.

Candidates must acquire the capability to present and discuss their work in their research community. Consequently, both the participation to international conferences and the publication of the research results in peer-reviewed journals are encouraged.

The PhD programme favors the candidates' research interactions with other groups in their research field, preferably abroad. Research visits of at least three months are strongly encouraged, as through them the candidates may acquire further skills to develop their research work and thesis.

The duration of the programme is normally three years.

6.3 Objectives and general framework of the teaching activities

The PhD Programmes and the PhD School activate teaching forms of different kind and credit value, including courses, seminars, project workshops, laboratories. Teaching activities both cover the basic research issues (problems, theories, methods), which represent the foundation of the PhD Programme and identify clearly its cultural framework, or analyze some research issues specific of the field considered by the Programme.

Lessons are usually held in English, except when indicated otherwise. The PhD Programme includes at least one complete path delivered in English language.

Structured teaching activities allow to earn ECTS credits. Other special activities, for which it is difficult
to evaluate the learning and its quantification, fall within the scientific activities taken into account by the Faculty Board in the overall evaluation, but they do not allow to earn ECTS.

The PhD School of Politecnico di Milano proposes a set of courses aiming to train the PhD candidates in soft and transferable skills. The skills and abilities provided by these courses are expected to help candidates across different areas of their careers in order to respond to the rapidly evolving needs of the global economy and society at large. The PhD School courses activated for the 2018-2019 Academic Year are summarized in the following table.

<table>
<thead>
<tr>
<th>Course name</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Innovative Teaching Skills</td>
<td>Magli</td>
</tr>
<tr>
<td>A - Research Skills</td>
<td>Sciuto</td>
</tr>
<tr>
<td>A - Scientific Models: Conceptual Foundations and Philosophical Issues</td>
<td>Valente</td>
</tr>
<tr>
<td>A - The Process of Research</td>
<td>Volontè</td>
</tr>
<tr>
<td>C - Advanced Interaction Skills for Academic Professionals</td>
<td>Arnaboldi</td>
</tr>
<tr>
<td>C - Issue Mapping</td>
<td>Ciuccarelli</td>
</tr>
<tr>
<td>C - La diffusione della Ricerca</td>
<td>Paganoni</td>
</tr>
<tr>
<td>C - Professional Communication</td>
<td>Di Blas</td>
</tr>
<tr>
<td>C - Science, Technology, Society, and Wikipedia</td>
<td>Raos</td>
</tr>
<tr>
<td>C - Scientific Communication in English</td>
<td>Biscari</td>
</tr>
<tr>
<td>E - Ethical Aspects of Research on Dual-Use Products</td>
<td>Masarati</td>
</tr>
<tr>
<td>E - Ethics in Research</td>
<td>Aliverti</td>
</tr>
<tr>
<td>E - Sulla Responsabilità della Tecnica</td>
<td>Ossi</td>
</tr>
<tr>
<td>E - Technology and Society</td>
<td>Crabu</td>
</tr>
<tr>
<td>E - The ageing society: a challenge for technological and social innovation</td>
<td>Ranci Sabatinelli</td>
</tr>
<tr>
<td>I - Industrial Skills</td>
<td>Biscari</td>
</tr>
<tr>
<td>I - Project Management (in Action)</td>
<td>Mancini</td>
</tr>
<tr>
<td>I - Project Management Basics</td>
<td>Fuggetta</td>
</tr>
<tr>
<td>I - Project Management PMI-CAPM Certification Preparation</td>
<td>Fuggetta</td>
</tr>
<tr>
<td>I - Strategic Decision Making</td>
<td>Ferretti</td>
</tr>
<tr>
<td>P - Design Thinking</td>
<td>Deserti</td>
</tr>
<tr>
<td>P - Empowering Imagination</td>
<td>Chiodo Schiaffonati</td>
</tr>
</tbody>
</table>
10 of the 25 course credits that each candidate is required to earn shall be obtained through soft and transferable skills courses organized by the PhD School.

Every year the PhD Programme in Materials Engineering will activate PhD level courses for at least 20 credits. The courses organized by the PhD Programme in Materials Engineering, summarized in the following tables, should be taken by the PhD student during the first two years of the PhD Programme. For all courses, attendance is mandatory and a final examination is required. Student evaluation can be carried out by means of either a written examination, written report, oral examination or seminar on a specific topic with final discussion. The evaluation method is described in each individual course syllabus and is chosen by the professor in charge.

Course syllabus and schedule can be found on the website of the PhD Programme in Materials Engineering. Course descriptions are also reported in the Study Programme (“Manifesto”) of the PhD in Materials Engineering.

The table below summarizes the rules for the presentation of the candidate's study plan. At the same time, candidates will be involved in their research activity in a continuous way, under their supervisor’s guidance.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Possible details or reference to following tables</th>
<th>Number of credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses characterising the PhD Programme in materials engineering</td>
<td>See Table A</td>
<td>15 min</td>
</tr>
<tr>
<td>PhD School Courses</td>
<td>See Table B</td>
<td>10 min</td>
</tr>
</tbody>
</table>

In the third year the candidate should be devoted entirely to the research and to the development of the PhD thesis.
PhD Course List

Type A COURSES

The PhD Programme in Materials Engineering offers the Characterizing Courses listed in table A. For the admission to the final exam the acquisition of 15 credits in this list is mandatory. The substitution of 5 of these credits with an equivalent number from other courses, e.g. deriving from extended research internships in other institutions, especially abroad, has to be approved by the Faculty Board of the PhD Course in Materials Engineering before the course is attended.

The Course activity of the PhD candidate is expected to be concentrated in the first two years of his/her PhD. To be admitted to the second year, the PhD student should have earned at least 10 credits by attending courses and passing the relevant examinations. Similarly, the Ph.D student should have acquired at least 20 of the 25 credits before starting the third year. Only a maximum of 5 credits should be attained during the third year (or possibly during the fourth year, in the case of prorogation, see 6.5). The list of PhD courses organized by the PhD Programme in Materials Engineering is available at the website: http://www.dottorato.polimi.it/corsi-di-dottorato/corsi-di-dottorato-attivi/ingegneria-dei-materiali/

Type B COURSES

The PhD School offers every year general and Interdoctoral courses. The acquisition of 10 credits is mandatory among the courses of B type. The list of PhD courses organized by the PhD School is available at the website http://www.dottorato.polimi.it/en/during-your-phd/phd-school-courses

PREPARATORY COURSES

If the supervisor and the tutor find it useful or necessary that the candidate attends preparatory courses (chosen among the activated courses at the Politecnico di Milano) the Faculty Board of the PhD Programme may assign some extra-credits to be acquired to complete the training. The Faculty board will decide in advance if credits acquired in this way will concur to the mandatory 25 ECTS credits or will constitute an additional requirement.

SPECIALISTIC COURSES, LONG-TRAINING SEMINARS

The attendance of Specialist Courses, Workshops, Schools, Seminars cycles is strongly encouraged and (if these seminars, workshops are certified and evaluated) may permit to acquire credits only if explicitly approved by the Faculty Board before the activity is attended. These courses and workshops can be inserted in the study plan, even if they are not evaluated (and therefore not qualified as credits), as optional “additional teaching”.
The scheduled course planning for the academic year 2018-2019 follows. Other courses may be activated during the year. In this case the candidates will be promptly informed and will be allowed to insert these new courses in their study plan.

Table A: PHD COURSES CHARACTERISING THE PHD PROGRAMME

<table>
<thead>
<tr>
<th>Name of the Course</th>
<th>Professor</th>
<th>Period</th>
<th>Language</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>The art of approximation in science and engineering</td>
<td>Bestetti</td>
<td>January</td>
<td>English</td>
<td>5</td>
</tr>
<tr>
<td>Simulation of molecular systems for chemistry materials and biology</td>
<td>Raos</td>
<td>To be defined</td>
<td>English</td>
<td>5</td>
</tr>
<tr>
<td>Methods for the compositional analysis and characterization of materials</td>
<td>Ossi/Raos</td>
<td>Three full days during the Academic Year</td>
<td>English</td>
<td>5</td>
</tr>
<tr>
<td>Material characterization (with laboratories) – Module 1 – SEM, EDS, SRD, GDOES, Optical Microscopy, Laser Profilometry</td>
<td>Brunella</td>
<td>May</td>
<td>English</td>
<td>5*</td>
</tr>
<tr>
<td>Material characterization (with laboratories) – Module 2 – NMR, FT-IR, RAMAN, DSC, DTA, TGA, AFM, STM</td>
<td>Mele/Derudi/Casari/Lucotti</td>
<td>To be defined</td>
<td>English</td>
<td>5*</td>
</tr>
</tbody>
</table>

* Either one or the other of these Courses can be inserted in the study plan

Table B SUGGESTED CROSS –SECTORAL COURSES

<table>
<thead>
<tr>
<th>Course name</th>
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</tr>
</thead>
<tbody>
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<td>A - Innovative Teaching Skills</td>
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<td>C - Advanced Interaction Skills for Academic Professionals</td>
<td>Arnaboldi</td>
</tr>
</tbody>
</table>
6.4 Presentation of the study plan

PhD candidates must submit a study plan, which may be revised periodically, in order to adapt it to possible changes in the course list, or to needs motivated by the development of their PhD career. The study plan must be approved by the PhD Programme Coordinator, according to the modalities established by the Faculty Board of the PhD Programme.

6.5 Yearly evaluations
Candidates present their work to the Faculty Board at least once a year. In particular, the candidates must pass an annual evaluation in order to be admitted to the following PhD year.

The third year evaluation establishes the candidate's admission to the final PhD defense. As a result of each successful annual evaluation, the candidates receive an evaluation (A/B/C/D). Candidates who do not pass the exam will be qualified as “Repeating candidate” (Er) or “not able to carry on with the PhD (Ei)”.

After the final year, candidates who have achieved sufficient results but need more time to draw up their theses, may obtain an additional year to complete their research work.

6.6 PhD thesis preparation

The main objective of the PhD career is the development of an original research contribute. The PhD thesis is expected to contribute to the advancement of the knowledge in the candidate's research field.

The PhD study and research work are carried out full time during the three years of the PhD course. Stages or study periods in (Italian or International) companies or external Institutions may complete the candidate’s preparation.

The resulting theses need to be coherent with the research issues developed in the Department where the PhD Programme is developed.

The candidate must present an original thesis and discuss its contribution to the state of the art in the research field in the research community.

The PhD research is developed following the lead of a supervisor, who supports the candidate in planning their research and in the everyday activities regarding the thesis development.

At the end of the PhD studies, the Faculty Board evaluates the candidates work. Candidates who receive a positive evaluation submit their theses to two external reviewers for refereeing. If the evaluation provided by the reviewers is positive (or after the revisions required by the external reviewers), the candidates defend their thesis in a final exam, in front of a Committee composed of three members (at least two of which must be external experts).
7. Laboratories, PhD Secretary Services

PhD candidates have access to the laboratories of research groups taking part in the PhD Programme in Materials Engineering, which are located in the “G.Natta” Department of Chemistry, Materials and Chemical Engineering (CMIC), and in the Department of Energy. The facilities of the laboratories “Servizio di Analisi Microstrutturale dei Materiali” (SAMM), “Laboratorio Analisi Chimiche” (LAC), “Laboratorio grandi apparecchiature: NMR, MS e fotochimica organica” and “Laboratorio Prove Polimeri” (LP3) located at CMIC, are also available.

PhD students can refer to the Secretariat of the PhD Programme for any teaching or administrative issues:

Katia De Vettori
Email: PhD-IM @polimi.it
Telephone: +39-02-2399-
Department: CMIC, Building 6, Leonardo campus

8. Internationalisation and inter-sectoriality

Carrying out part of the study and research activity at external laboratories is strongly recommended. Politecnico di Milano supports joint PhD paths with International Institutions, as well as Joint and Double PhD Programmes.

Further information is available on the PhD School website and on the PhD Programme website.

More specifically, formal agreements are active between the PhD Programme in Materials Engineering and:

• KATHOLIEKE UNIVERSITEIT LEUVEN (joint PhD degree)
• XI’AN JIAOTONG UNIVERSITY (China)
• ECOLE NATIONALE SUPERIEURE DES MINES DE SAINT-ETIENNE (co-tutelle)
• PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Further Research collaborations (PhD students exchanges, research stages, visiting professors) are active with the following Universities and Research Centres:

• MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON (US)
Interaction with and exposure to non-academic institutions provides significant benefits to both doctoral candidates as well as to research and innovation intensive institutions.

In particular, the PhD Programme in Materials Engineering collaborates with the following Research Agencies and/or Industrial partners.

- APCE
- IIT FONDAZIONE ISTITUTO DI TECNOLOGIA
- INSTM
- INAF OSSERVATORIO ASTRONOMICO DI BRERA
- INNOVHUB - AZIENDA SPECIALE INNOVHUB STAZIONI SPERIMENTALI PER L’INDUSTRIA DELLA CAMERA DI COMMERCIO DI MILANO
- RICERCA SISTEMA ENERGETICO - RSE S.P.A.
- STMICROELECTRONICS
- FATER S.P.A.
- ELECTROLUX PROFESSIONAL S.P.A.
- SOLVAY SPECIALTY POLYMERS
- ENI SpA
- LOGIC SPA
Scholarships for PhD projects on specific research topics are currently financed by several Agencies or Industrial partner listed above.

[Report a list of all the Inter-sectorial collaborations declared in the Accreditation process, with some specific description of the collaboration, if appropriate]
Attachment A1 – PhD Programme Coordinator

Born in Milano, 1959; 1983: Degree (laurea) in Physics (cum laude) at University of Milano; 1985: Diploma (cum laude) of Scuola di Specializzazione in Scienza dei Polimeri “G. Natta” (Politecnico of Milano); 1989: PhD degree in Industrial Chemistry (University of Milano); since 1990 at Department of Chemistry, Material and Chemical Engineering “Giulio Natta” of Politecnico of Milano as: Researcher (1990); Associated Professor in Material Science and Technology (2001). Since 2010: Full Professor in Materials Science and Technology at Politecnico di Milano.

Management activities: Since 2005, Chiara Castiglioni is the Coordinator of FuNMat (Organic Functional and Nanostructured Materials) Laboratory at the Department of Chemistry, Material and Chemical Engineering “Giulio Natta” of Politecnico of Milano Spectroscopy at FuNMat Lab. Since 2010 she is the Coordinator of the PhD Course in Materials Engineering (Politecnico of Milano). Chiara Castiglioni is member of the Scientific Committee of SoLINano laboratory at Politecnico di Milano.

Other management activities: Didactic Secretary of the Scuola di Specializzazione in Scienza dei Polimeri “G. Natta” (1991-1996) and of the PhD Course on “Materials Engineering” (Politecnico of Milano); 2007-2009: Vice-coordinator of the PhD Course on “Materials Engineering” (Politecnico of Milano) 2007: Member of the organizing board of “CNES 2007” (Primo Congresso Nazionale di Electrospinning)
2014 - 2016 - 2018: Member of the International Advisory Board of the International Congress on Synthetic Metals ICSM2014, ICSM2016, ICSM2018
2001-2003: Member of the Scientific board of GNSR (Gruppo Nazionale di Discussione per le Spettroscopie Raman e gli Effetti Non-Lineari)

Editorial responsibilities:
Since January 2011: Member of the Editorial Board of Journal of Raman Spectroscopy (Wiley)
1995-1998 : Member of the Editorial Board of "Vibrational Spectroscopy" (Elsevier);
1996-2002: Member of the Editorial Board of "Spectroscopy Letters" (Dekker)

Teaching Activities at Politecnico di Milano:
Presently - since 2005 - she is lecturer of the Courses: "Introduction to Materials Science" (Laurea in Materials Engineering and Nanotechnologies) and “Materials Science and Technology” (Laurea in Physical Engineering).
Lecturer of the following Courses at Politecnico of Milano:
Since 2002: “Struttura e caratterizzazione dei Polymers”
1992-1996: Lectures at the Scuola di specializzazione in Scienza dei Polimeri “G. Natta” (Politecnico of
Chiara Castiglioni is author of about 260 contributions - papers published on peer reviewed International Journals, Contributions (Chapters) to scientific books/handbooks and Conferences Proceedings; author of about 200 notes presented to International or National Congresses and 17 invited talks at International Conferences or Schools.

From Scopus: H-index = 33 (calculated on 177 documents). Sum of the times cited = 4333

ORCID: 0000-0002-6945-9157
Scopus Author ID: 7004414141
ResearcherID: A-6897-2017

**Main research interests in the field of:**
- Nanostructured carbon materials (amorphous carbon, nanostructured graphites, carbon nanotubes, polycyclic aromatic hydrocarbons (PAHs) and carbon nanoribbons, linear carbon chains).
- Ions intercalated graphites and doped graphite/graphenes from Electrochemical treatments.
- Vibrational dynamics and spectroscopy of semi-crystalline and amorphous polymers (phonon dispersion relations, conformational defects, chain orientation, intermolecular interactions).
- Vibrational intensities and electro-optical parameters (Charge distribution from Infrared Intensity; local Raman parameters from Raman Intensities).

Techniques of investigation: Experimental Infrared and Raman Spectroscopy; Theoretical Simulations (classical vibrational dynamics, first principles Quantum Chemical calculations).

Her research activity has been mainly devoted to the analysis of the spectroscopic and optical response of materials (non-resonant and resonant Raman scattering, Infrared absorption, molecular polarizability and refractive index) aiming at the description of the molecular and electronic structure, intra-molecular potential energy and intermolecular interactions, electrical and optical (linear and non-linear) properties of the materials.

**Participation to Research Projects:**
- PRIN 2001: “Processi multifotonici in materiali molecolari coniugati e sistemi organizzati a trasferimento di carica” Progetto N° 2001034442_007
- FIRB 2001 dal titolo: “Micro e nanostrutture di Carbonio”, Progetto N° RBNE 019NKS.
- Network of Excellence on Materials Engineering and Nonstructured Surfaces (NEMAS) del Politecnico di Milano
- PRIN2004: “Materiali molecolari e nanostrutture per fotonica e nanofotonica” Progetto N° 2004033197_006 (Responsabile Scientifico di Unità di Ricerca)
- PRIN 2006: "Polimeri fotocromici per lo sviluppo di innovative superfici di riferimento riscrivibili per interferometria" Progetto: 2006033499 (Responsabile Scientifico di Unità di Ricerca dal 2009)
- PRIN 2008: "Fotorivelatori organici: dalla sintesi del materiale alla caratterizzazione optoelettronica"
  Progetto: 2008JKBBK4_003 (Responsabile Scientifico di Unità di Ricerca)
- FIRB 2003: “Composti molecolari e materiali ibridi nanostrutturati con proprietà ottiche risonanti e non risonanti per dispositivi fotoni” – Progetto N° RBNE033KMA_006
- CARIPOLO (2006): “Materiali nanostrutturati autoassemblati di rilevanza biologica” (Responsabile Scientifico)
- Coordinator of the Research Unit “Chimica” nel progetto di ricerca “Individuazione di microseepage mediante tecniche di remote sensing” (Progetto Geoscienza Eni-Politecnico, 2009-2011)
- Research leader of the Project “Analisi di un dataset geochimico da integrare nell’interpretazione di dati tele rilevanti MIVIS su area desertica di interesse Eni” (2011-2012)
- Research leader of the project “Analisi del blocco algerino 222B con dati iperspettrali MIVIS” (progetto microseepage 3) (2011-2013)
- Scientific collaborations and research projects with Solvay Specialty Polymers (molecular modelling of fluorinated polymers and molecules) and CEFRIEL (Industrial applications of the NIR spectroscopy).

Attachment A2 – PhD Faculty Board

Description of the composition of the Faculty Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Scientific Disciplinary Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiara Castiglioni (coordinator)</td>
<td>Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta</td>
<td>ING-IND/22</td>
</tr>
<tr>
<td>Francesco Briatico Vangosa (vice-coordinator)</td>
<td>Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta</td>
<td>ING-IND/22</td>
</tr>
<tr>
<td>Marco Beghi</td>
<td>Dipartimento di Energia</td>
<td>FIS/03</td>
</tr>
<tr>
<td>Chiara Bertarelli</td>
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**Attachment A3 – PhD Advisory Board**

Description of the composition of the Advisory Board
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<td>Edoardo Bemporad</td>
<td>Dip. Ingegneria Meccanica e Industriale, Università Roma Tre</td>
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<td>Marco Bernasconi</td>
<td>Dip. Scienza dei Materiali, Università Milano Bicocca</td>
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<td>Emanuele Carpanzano</td>
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<td>Marco Ferrera</td>
<td>ST Microelectronics</td>
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<tr>
<td>Stefano Gialanella</td>
<td>Dip. Ingegneria Industriale, Università di Trento</td>
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<td>Alessandro Martucci</td>
<td>Dip. Ingegneria Meccanica, Università di Padova</td>
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<td>Laura Montanaro</td>
<td>Dip. Scienza dei Materiali e Ingegneria Chimica, Politecnico di Torino</td>
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<tr>
<td>Stefano Radice</td>
<td>Solvay-Solexis SpA</td>
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<td>Riccardo Po’</td>
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<td>Mario Sobacchi</td>
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<tr>
<td>Francesco Stellacci</td>
<td>Department of Materials Science and Engineering, EPFL, Lausanne(CH)</td>
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