

**DOCTORAL PROGRAM IN**  
**MECHANICAL AND INDUSTRIAL ENGINEERING**

**Internal acronym: DRIMI**  
**External acronym: DRIMI-UniBS**

**COURSE RULES AND REGULATIONS**  
**(unanimously approved by the Academic Board on April 3, 2014,**  
**with amendments adopted March 31, 2015)**

**1. Course Name**

PhD Course in MECHANICAL AND INDUSTRIAL ENGINEERING, acronym DRIMI, for the preparation and scientific training of young people who have obtained a Master of Science or Engineering or other degree considered equivalent by the course admission Committee.

**2. Objectives of the Course Program**

The goal of the DRIMI course is to train researchers and professionals with high technical-scientific profiles, characterized by the technical knowledge, experience, independence and skills that are needed to assume leadership roles in the industrial sectors in research, innovation, development, design, production, and logistics. The independence is acquired through technical and scientific research of academic level, whether focused on industrial applications and conducted in collaboration with private or public companies, or focused on the development of the scientific foundations of the technologies underlying industrial applications and innovation, conducted on institutional financing by national and international bodies such as the Ministry of Education and the ERC.

**3. Administrative Headquarters of the Course**

The University of Brescia is the administrative headquarters of the DRIMI. There are no associated external partners.

**4. Reference scientific areas**

Reference research areas for the DRIMI, according to the Italian official classification of scientific disciplines (SSD), are as follows (in parentheses Area number / Sector):

CHIM/07 Fondamenti di Chimica per le Tecnologie (03/B2)

FIS/01 Fisica Sperimentale (02/A1)

ING-IND/08 Macchine a Fluido (09/C1)

ING-IND/09 Sistemi per l'Energia e l'Ambiente (09/C1)

ING-IND/10 Fisica Tecnica Industriale (09/C2)

ING-IND/11 Fisica Tecnica Ambientale (09/C2)  
ING-IND/12 Misure Meccaniche e Termiche (09/E4)  
ING-IND/13 Meccanica Applicata alle Macchine (09/A2)  
ING-IND/14 Progettazione Meccanica e Costruzioni di Macchine (09/A3)  
ING-IND/15 Disegno e Metodi dell'Ingegneria Industriale (09/A3)  
ING-IND/16 Tecnologie e sistemi di lavorazione (09/B1)  
ING-IND/17 Impianti Industriali Meccanici (09/B2)  
ING-IND/21 Metallurgia (09/A3)  
ING-IND/22 Scienza e Tecnologia dei Materiali (09/D1)  
ING-IND/35 Ingegneria Economico Gestionale (09/B3)  
ING-INF/04 Automatica (09/G1)  
ING-INF/07 Misure Elettriche e Elettroniche (09/E4)

## **5. Duration of the Course**

The training program of the DRIMI normally lasts three years, extendable for an additional year for the PhD students for whom the Academic Board deems it necessary.

## **6. Department Affiliation**

The DRIMI, in terms of logistics and support for research activities, is affiliated to the Department of Mechanical and Industrial Engineering (DIMI).

## **7. Doctoral School Affiliation**

The DRIMI, in terms of coordination and training activities, is affiliated to the Doctoral School in Engineering Science.

## **8. Structure and bodies**

The governance of the DRIMI is structured in the following bodies:

- Academic Board
- Sections
- Coordinator
- Section Representatives
- Steering Committee

### **8.1 Academic Board**

The composition of the Academic Board is updated annually in conjunction with the process of activation of each new cycle. The composition is updated on a proposal of the Steering Committee taking into account:

- national and local regulations;
- scientific, organizational and quality assurance needs of the doctoral program;
- the composition of the previous cycle, the instances of participation by researchers belonging to reference SSD's of course or to other SSD's;
- the scientific productivity of the components;

- the advisability to invite professors and / or researchers from other institutions.

Changes in the composition are approved by the Academic Board in advance and except in emergencies, have effect from the date of start of the new cycle.

The Academic Board is divided into Sections.

The Board will be convened at least once a year and whenever the Coordinator or the Steering Committee deem it necessary. The Board shall also be convened whenever requested by at least 25% of the components.

## **8.2 Sections**

Due to the relatively large number of graduate students and the broad spectrum of research topics that they will cover, the organizational and management load of the DRIMI will be apportioned among the members of the Academic Board requiring them to adhere to one and only one of the sections that identify the main areas of graduate research. Each Section must select a Representative who will sit in the Steering Committee.

## **8.3 Coordinator**

The Coordinator, elected by secret ballot by the Academic Board among the members who are associate or full professors, remains in office for three years and may be re-elected, but only for a second consecutive term. The Coordinator is in charge of the administrative direction of the DRIMI. The Coordinator shall convene and chair the Academic Board and the Steering Committee. The Coordinator appointment among the members of the Steering Committee, a Vice-Coordinator who replaces him in all mandatory aspects in cases of impediment or absence. The Coordinator may appoint from time to time and/or function by function a delegate among the members of the Academic Board. In order to expedite the process of formal approval of the various steps of the PhD student's careers and the various formalities required at the Academic Board, the Coordinator will take urgent measures to be proposed for ratification at a subsequent meeting of the Board, possibly calling for short routes and informal gathering or by electronic mail to the opinions and/or approval by those members of the Board the Coordinator deems necessary to consult.

## **8.4 Section Representatives**

Section Representatives shall be elected by secret ballot by the Academic Board among the members who are associate or full professors, remain in office for three years and may be re-elected, but only for a second consecutive term. The Representatives shall automatically lapse from office each time new elections for the Coordinator are held. The election of Representatives is usually done together with the election of the Coordinator.

## **8.5 Steering Committee**

The Steering Committee is formed by the Coordinator and the Section Representatives. It is intended to assist the Coordinator in its administrative functions and in addressing the scientific activities of the PhD program and to represent the needs and peculiarities of training and candidate selection of the different Sections.

The meetings of the Steering Committee shall be convened for short routes when necessary, possibly initiated by the members themselves and are valid if at least three fifths of the members are present. Decisions are made if at least three fifths of the members are in agreement, regardless of the number of those present. In case of a tie, if the measure is to be taken urgently the opinion of the Coordinator (or the Vice-Coordinator in the absence of the Coordinator) prevails otherwise the matter is held for further investigation and if possible for the next meeting of the Academic Board.

In addition, the Steering Committee performs specific tasks by proxy from the Academic Board.

## **9. Functions of the Academic Board**

The Academic Board has the following functions:

- it provides annually, through the Coordinator, indications to the central and departmental administration on the number of PhD students that the course can accommodate for the next cycle;
- it formulates proposals about teaching activities;
- it organizes teaching activities and sets their timetable;
- it appoints for each new PhD student a Tutor who must be a member of the Academic Board, a Thesis Advisor and possibly one or more Thesis Co-Advisors;
- it approves the Research Proposal submitted by every PhD student, signed by the Thesis Advisor and the Tutor, and illustrated to the Board by the Tutor;
- it examines the Annual Reports submitted by every PhD student, signed by the Thesis Advisor and the Tutor, and illustrated to the Board by the Tutor;
- it approves any teaching activity that the PhD student is authorized to perform upon motivated request by the Thesis Advisor through the Tutor;
- it formulates a Yearly Judgment about the overall academic and scientific research progress made by the PhD student;
- it decides upon the admission of the PhD student to the next year;
- it proposes to the Rector, giving its reasons, the possible exclusion of a PhD student from the continuation of the course;
- it decides upon the admission of the PhD student to the final thesis defense;
- it transmits to the Competent Office, through the Coordinator, the annual reports on the activities carried out by PhD students;
- it decides upon instances by Professors and Researchers who request to be considered to become members of the Academic Board;
- it decides as part of the process of activation of each new cycle the annual update of the Academic Board composition to take office from the beginning of the new cycle;
- it decides on the criteria for the selection of new students;
- it decides on how to publicize the activities of the PhD program, the number of available seats for the new cycle, and the number of available externally sponsored research assistantships;
- it decides on any changes to the present set of Rules and Regulations;

- it assigns the credits earned by the students as a result of their training activities;
- it decides on the organization of the web pages of the program and assigns to the PhD student representatives specific tasks to organize their active maintenance, coordination and monitoring that the individual PhD students keep updated pages in relation to their research activities and achievements.

The Board may delegate certain functions to the Steering Committee specifying time limits or functional constraints.

At the invitation of the Academic Board, the PhD student Representatives may attend its meetings or the discussion of specific points without voting rights. The Academic Board may also invite external experts without voting rights if deems useful to obtain their scientific, educational, technical or financial advise.

Academic Board meetings are valid if the majority of members, counting each justified absent as a present. Decisions are taken by majority of those present. In case of a tie, the opinion of the Coordinator (or the Vice-Coordinator in the absence of the Coordinator) prevails.

## **10. Thesis Advisor, Thesis Co-Advisors, Tutor**

The Academic Board assigns each PhD student to a Thesis Advisor who may indicate possible Thesis Co-Advisors chosen from experts in the fields of interest. The Thesis Advisor does not have to be a member of the Academic Board. Any Co-Advisor need not be a professor or a university researcher. For each PhD student, the Board shall also appoint a Tutor chosen from among the members of the Academic Board itself. The Tutor can coincide with the Thesis Advisor or one of the Co-Advisors.

By the end of the first year, upon proposal by the Thesis Advisor, the Academic Board appoints a Thesis Committee for each PhD student, composed of at least three members including the Thesis Advisor and the Tutor, who chairs it.

The Thesis Advisor, any Co-Advisors, and the Tutor are normally assigned to the PhD student during the first month of activity. Students belong to the Section of their Tutor.

The duties of the Thesis Advisor, with possibly with the support of the Co-Advisors and the Tutor, are:

- to identify weaknesses in the background preparation of the PhD student;
- to help the PhD student structure his/her training and research activities and to stimulate and support him/her all along the course of study;
- to propose to the Academic Board, possibly through the Tutor, the training path that the PhD student will have to follow in early stages of the course of study;
- to agree with the PhD student and countersign the research proposal that she/he must submit to the Academic Board;
- to monitor the progress of the PhD student and inform the Tutor and the Coordinator in case of difficulty;
- to propose, share and countersign with the Section Representative any request that the PhD student may address to the Academic Board or to the Coordinato (special leaves of absence, permissions for external activities, etc) or that the Thesis Advisor may address on behalf of the PhD student (authorizations to conduct teaching or seminar training activities, etc).

In cases of Graduate studies in Apprenticeship (Advanced Training in Apprenticeship) and of Industrial or Executive PhD programs, it is the Thesis Advisor, not the Tutor, who takes on, in all respects, the roles and responsibilities that the law assigns to the University Tutor. The Thesis Advisor collaborates with a Company Tutor.

The task of the Tutor, with the support of the Thesis Advisor is to report to the Academic Board about any weaknesses in the background preparation of the PhD student, her/his planned training and research activities, the state of advancement of her/his proposal and research activities, any difficult situations, requests for special leaves, permissions for external activities, to conduct teaching activities, etc. In particular, the Tutor is delegated by the Academic Board to prepare the case for admission of the PhD student to the next year and the final exam, presenting in to the Board and proposing a resolution. The Tutor's responsibility is limited to the same tasks even in the cases of Graduate studies in Apprenticeship and Industrial or Executive PhD programs, while it is the Thesis Advisor who shall perform the duties and assume the responsibilities that the law assigns to the University Tutor.

### **11. Research Activity of the PhD Student**

Objective of the research of PhD student is to contribute with original ideas to the advancement of the state of the art of the techno-scientific topic defined in his/her Research Proposal. Milestones for achieving this objective are:

1. acquire a thorough knowledge of the current state of the art and the motivations that lead to improve it;
2. actively cooperate with the Thesis Advisor and any Co-Advisors to design and contribute to a research program aimed to the desired results;
3. acquire the ability to work with the Thesis Advisor and the Co-Advisors to prepare scientific manuscripts in English on the results obtained, pursuing the canons of internationally recognized scientific journals considered as reference for at least one of the scientific areas of research;
4. tackle the peer review and gain acceptance for the publication of at least one of the manuscripts of the previous point by one of said journals; such acceptance will be an important recognition of the originality of the results achieved;
5. acquire the ability to communicate effectively in English the results of his/her research activities according to the canons of international technical and scientific communication.

### **12. Research Proposal**

Within nine months from the start of the course, the PhD student formally submits to the Academic Board his/her Research Proposal, countersigned for approval by the Thesis Advisor.

### **13. State of Advancement of Research, Thesis Committee**

Within nine months of each year of the course, the PhD student formally submits to the Tutor and the Coordinator a provisional report on State of Advancement of his/her Training and Research Activities, with reference to his/her Research Proposal, possibly reformulated and, again, countersigned for approval by the Thesis Advisor.

The Academic Board, upon hearing the report by the Tutor, formulates its recommendations.

At the end of the year the PhD student presents his/her final annual report to a Thesis Committee appointed by the Academic Board and chaired by the Tutor. The discussion is public and is usually done immediately after a brief oral presentation by the PhD student.

Based on the report and the discussion, the Thesis Committee proposes to the Academic Board, through the Tutor, a resolution about the admission of the PhD student to the next year or else his/her exclusion from the course.

## **14. Curriculum**

### **14.1 Fundamental Phases of PhD Training Program**

The training of PhD student consists of the following key moments:

a) Introductory courses. Training aimed at standardizing the knowledge base of the students, bearing in mind their previous curricula of studies and compensating for weaknesses in their preparation as identified by the Academic Board upon recommendation by the Thesis Advisor. To this end, each doctoral student will be required to attend one or more courses, passing the final exam(s). It is the student's responsibility not only to progress along the path approved by the Academic Board but also take action promptly to ensure that every step of his/her path be defined in agreement with the Thesis Advisor well in advance with respect to the timing defined in the present set of Rules and Regulations, promptly informing the Coordinator in case of difficulty or disagreement.

b) Specialized training. The training of the PhD students is completed according to an individual plan that the student compiles with the Thesis Advisor and submits through the Tutor for approval by the Coordinator who for that purpose may consult the Academic Board as necessary, even only informally. Specialized training can also be done by means of participation in schools, conferences, congresses and courses offered by other PhD courses, by the Doctoral School, by other universities, scientific associations, etc. or other public or private entity deemed appropriate by the Board.

c) Scientific and technological research. Scientific and/or technological research is the core activity characterizing the doctoral program. The graduate student is required to carry it out under the supervision and direction of the Thesis Advisor. Within the first nine months of the first year, the student is required to identify the main topic of research which he/she intends to pursue. The submission to the Academic Board of the Research Proposal is the first formal moment of verification. Subsequent verifications take place annually through the formal presentation of the State of Advancement of Research to the Thesis Committee specifically appointed by the Academic Board.

d) Update of the Research Proposal. If the scientific goals of the doctoral research should vary significantly as it proceeds, the Research Proposal must be updated and resubmitted together with the next State of Advancement of Research.

e) Stages in external research institutions, national or foreign. Notwithstanding that the training, research and optional teaching activities of the PhD student will take place primarily at the University of Brescia (or at public or private corporation under suitable agreement), it is highly desirable that the student carries out part of the research activities at other research institutions, preferably abroad. It is responsibility of the Thesis Advisor to create the necessary contacts so that the student can take advantage of a period of stay offsite normally of 6 months at a research institute in

which to carry on a part of the project described in the approved Research Proposal. It is responsibility of the PhD student to keep the Thesis Advisor constantly informed of the progress held offsite and to notify promptly the Tutor in case of problems.

f) Internships in companies. PhD students can carry out periods of study and research at companies with which suitable cooperation agreements have been signed. It is responsibility of the Thesis Advisor to create the necessary contacts so that the student can take advantage of such opportunities in line with the objectives of the approved Research Proposal and with the milestones for achieving the technical-scientific objectives of the PhD course as specified below. In the agreement with the company a Company Tutor will be identified who in close cooperation with the Thesis Advisor will direct and oversee the activities carried out by the student at the company so as to enable her/him to achieve such objectives.

g) Teaching activities by the PhD student. The Academic Board, upon motivated request by the Thesis Advisor, may assign to the PhD student a limited amount of teaching activity in the form of seminars so as to allow her/him to improve her/his skills of synthesis and effective scientific communication.

h) Possible term extension. Should it be necessary to achieve the desired results, especially in light of the steps defined above as fundamental, the term of formation of the PhD student may be extended by one year. During the fourth year the PhD student does not perceive any scholarship from the doctoral program, but may apply for other forms of research assistance if available on a subject deemed useful to the attainment of the objective of concluding successfully his/her PhD program.

i) Doctoral Thesis. The PhD thesis, to be written in English, with an adequate summary in Italian, is the epitome of individual and independent research conducted by the PhD student under the close supervision and with the cooperation of the Thesis Advisor. The thesis must be submitted within the deadlines specified in the present set of Rules and Regulations.

#### **14.2 Research training credits (CFR) acquired during the training program**

Quantification of the student's activity is done through the instrument of research training credits (CFR). In particular:

a) the overall course of study is estimated at least 180 CFR (approximately 60 per year) and therefore the acquisition of at least 180 CFR is one of the requirements for admission to the final examinations;

b) at least 15 but not more than 70 CFR must be acquired by participating in training activities of various type as approved by the Academic Board;

c) at least 120 but not more than 165 CFR must be acquired for research and laboratory activities under the supervision and in collaboration with the Thesis Advisor;

d) the training activities to make up for specific weaknesses in the previous academic curriculum may not exceed a maximum of 15 CFR.

The training activities are to be carried out mainly in the first half of the doctoral program.

The CFR for training activities of various types can be acquired by attending:

a) courses organized under the DRIMI or of the Doctoral School to which DRIMI is affiliated, summer schools, etc (max 1 CFR every 6 hours);

b) individual seminars or cycles of seminars (maximum 0.5 CFR / seminar);

c) courses offered within the regular graduate and undergraduate programs of the University of Brescia, or of other universities (maximum 0.8 CFR / CFU).

The CFR will be allocated to each activity by the Academic Board according to the specificities of each activity and the type of final examination that took place.

The CFR for research and laboratory activities are acquired through:

- a) research (1 CFR every 25 hours of activity, minimum 30 CFR / year);
- b) research periods at foreign institutions (up to 5 CFR each month);
- c) research in industrial laboratories or research centers (up to 5 CFR each month).

## **15. Representatives of doctoral students**

Students elect annually two representatives and two alternates. They are consulted by the Academic Board on issues regarding the general progress of the course and the training activities.

## **16. Thesis Evaluators**

As soon as possible, and in all cases at least 120 days before the Deadline (defined as the date of the end of the three-year program or of the following year if the PhD student has obtained an extension), the Thesis Advisor, identifies two international experts on the subject defined by the Research Proposal and, after consulting the Thesis Committee, proposes to the Coordinator and the Academic Board, in writing and with a brief motivation, their appointments as Thesis Evaluators.

## **17. Admission to the Thesis Defense**

To initiate and complete the application for admission to the Thesis Defense, the PhD student must assure the timely completion of the following steps.

1. At least 120 days before the Deadline (defined as the date of the end of the three-year program or of the following year if the PhD student has obtained an extension) the Thesis Advisor sends the draft of the Thesis to the Thesis Evaluators who are required to express a written judgment about the innovativeness and scientific quality of the thesis work and to email it directly to the Coordinator and Thesis Advisor.
2. The Thesis Evaluators receive the draft of the Thesis at least 90 days before the Deadline, and deliver a positive opinion within 60 days of receipt. The Thesis Evaluators will not necessarily be part of the Thesis Defense Committee for the PhD student.
3. At least 15 days before the Deadline the PhD student must demonstrate to have published or at least obtained the formal acceptance of at least one scientific article on his/her doctoral studies, in which the PhD student appears as the first author and the Thesis Advisor as one of the co-authors. The publication must be in one of the scientific journals identified in Annex C of the present Rules and Regulations. In addition, the PhD student must prove to have participated in at least one International Scientific Congress with an oral presentation on the topics of his doctoral research.
4. Within 15 days from the Deadline the PhD student must deliver a copy of the Thesis to the Coordinator countersigned by the Thesis Advisor and the Co-Advisors.

The lack of any part of the above documentation will result in exclusion from the Thesis Defense unless otherwise decided by the Academic Board based on a reasoned and documented request by the PhD student.

Based on the above documentation and upon evaluation of all Yearly Judgments on the student, the Academic Board, also by electronic means, shall decide before the Deadline on the admission of PhD student to the Thesis Defense.

### **18. Thesis Defense**

The Thesis Defense consists of an oral interview in front of a Board of Examiners appointed as determined by the university rules about PhD courses. Given that the Board of Examiners is sovereign, the Coordinator will provide the Examiners with all the Yearly Judgments about the PhD candidate and suggest that the examination will normally be contained within 60 minutes per candidate; in the first 35-40 minutes the candidate formally presents, normally in English, the thesis work; over the next 20-25 minutes the questions from the Examiners are designed to verify the mastery that the PhD student has achieved in the field as well as his/her ability to defend the scientific results obtained as described in the PhD thesis.

### **19. Collaboration with public institutions or private corporations, Italian or foreign, that enable doctoral students to acquire work experience (DM 224/99 art. 2, comma 3 d).**

The training of the student may also include work experience in public institutions or private corporations, Italian or foreign, who have signed special agreements with the University of Brescia.

### **20. Transitional and final provisions**

What is not specifically mentioned in this set of Rules and Regulations, is ruled by the national and local regulatory framework listed in Annex A.

In the first application, in order to ensure the continuity of scientific approach with the four doctoral courses that have joined to form the course DRIMI and which have already been active for a decade in the Department of Mechanical and Industrial Engineering, the following four Sections are activated:

A) Materials for Engineering: acronym **DRIMI-Mat**;

B) Applied Mechanics: acronym **DRIMI-MeccApp**;

C) Design and Management of Integrated Logistic and Production Systems: acronym **DRIMI-ProLog**;

D) Energy, Fluid&Thermal, and Manufacturing Systems and Technologies: acronym **DRIMI-TeSE**.

The main Research Topics broadly identify the research Areas of the four Sections listed in Annex D.

In the first application, in order to ensure as far as possible the continuity of scientific approach with the four PhD courses already active for a decade that have joined to form the course DRIMI, also in order to acquire the management experience thus gained, the Section Representatives are as follows:

- "Materials Engineering" Section Representative: Prof. T. Riccò;

- "Applied Mechanics" Section Representative: prof. G. Legnani;
- "Design and Management of Logistics Systems and Integrated Production" Section Representative: prof. M. Perona;
- "Technology and Energy Systems, thermofluidodynamic and Machining" Section Representative: prof. P. Poesio.

Prof. P. Poesio will also serve as Secretary of the Steering Committee.

## **21. Amendments**

Amendments to this set of Rules and Regulations must be approved by the majority of the members of the Academic Board.

## **Annex A – Regulatory framework**

Upon entry into force of this set of Rules and Regulations, the national and local regulatory framework consists of the following documents:

- articolo 71 del D.P.R. 382 del 1980
- articolo 4 della Legge 210 del 03.07.1998
- D.M. 224 del 30.04.1999
- Legge 240 del 30.12.2010
- Regolamento Didattico di Ateneo (articolo 7)
- Regolamento di Ateneo per le Scuole di Dottorato di Ricerca (23.03.2011)
- D.M. 45 del 8.02.2013
- Regolamento di Ateneo per i Corsi di Dottorato di Ricerca (D.R. 336 del 27.06.2013, replaces D.R. 1006 del 05.07.2011)

## **Annex B – Admission procedures and requirements**

***WARNING: This annex is intended only to establish guidelines for the formulation of the call for applications, which however may vary from year to year upon interaction with the offices. Therefore, candidates applying for admission should not refer to the contents of the present annex but should refer exclusively to the text of the official call for applications.***

### **B.1. Admission prerequisites**

Candidates must have an MS degree in engineering, physics, mathematics, chemistry, economy, or an equivalent degree. Candidates who are about to receive such degree can also apply but their admission is subject to the condition that they obtain it by the date specified in the official call for applications.

### **B.2. Application procedure and requirements**

All Candidates must include in their application the following documentation in addition to that already described in the general part of the present Call:

1. a detailed Curriculum Vitae, in English; the CV has to be provided using the form available online in the UniBS website (file: named DRIMI\_ApplicationForm.doc). The file has to be filled in, signed, dated, scanned into a pdf document, and renamed as “Lastname\_DRIMI\_ApplicationForm.pdf”;
2. at least one Recommendation Letter; to provide such letter the form DRIMI\_LetterOfRecommendation.doc has to be used. This form (available online in the UniBS website) has to be filled in by the reference person, printed on the reference person’s letterhead, signed, dated, scanned and renamed as “Lastname\_DRIMI\_LetterOfRecommendation.pdf”;
3. the title and a summary in english of their Master thesis, and any other documents deemed useful by the candidate for his/her scientific evaluation (all such documents must be scanned and collected in a single PDF file named “Lastname\_DRIMI\_OtherDocuments.pdf”);
4. A brief Statement of their Scientific Interests and Motivation (max 2500 characters, including spaces) to be elaborated in the light of the Research Areas and Research Topics of the PhD Program listed in the webpages <http://www.unibs.it/education/phd-programmes/engineering-0/mechanical-and-industrial-engineering> . The objective of the Statement must be to
  - describe the motivations for the application to the doctoral program;
  - indicate in which scientific area he/she aims at developing his/her research; it is possible to indicate a second area of interest, but in that case a priority has to be clearly stated.
  - The statement of motivation and research interests must be written in English (or in Italian, with at least the general motivation in English).
  - The Candidate must use the form “DRIMI\_StatementOfMotivation&ResearchInterests.doc” (available online in the UniBS website); the form has to be filled in, signed, dated, scanned in pdf and named “Lastname\_DRIMI\_StatementOfMotivation&ResearchInterests.pdf”

5. A Research Project Proposal with the following features:
- The topic has to meet one of the research area developed within the doctoral program;
  - The proposal must be written in English or in Italian (in this case the abstract must be in English);
  - The proposal cannot exceed 15000 characters (including spaces);
  - It must include: title, research area, abstract, research goal, literature review, expected results, methodology, references;
  - The proposal must be written following the template available on the university website (file: DRIMI\_ResearchProjectProposal.doc); such template must be filled in, signed, dated, scanned in pdf and renamed "Lastname\_DRIMI\_ResearchProjectProposal.pdf"

Failure to submit the research project will imply automatic exclusion of the Candidate from further evaluation. The project proposal is submitted for evaluation purposes only and need not coincide with the research topic that the candidate will develop during her/his doctoral studies.

### **B.3. Evaluation criteria**

The Evaluation Committee will proceed by first evaluating only items 1, 2 and 3 as specified above.

The Evaluation Committee will not evaluate the Candidates whose curriculum is judged as "not in line with the scientific interests of the doctoral program" will be excluded from the evaluation. Also candidates who should not have submitted the Research Project Proposal will be excluded from further examination.

The maximum score for the evaluation of the documents submitted as items 1, 2 and 3 is 20 points, which the Evaluation Committee will assign on a comparative basis taking into consideration the following elements:

- Final mark obtained in the MSc program (or average mark for those who have not yet completed the program, only in case the Call allows them to participate);
- MSc thesis project and subsequent scientific activities related to the scientific interests of the doctoral program;
- Awards, honors, and other titles
- International activities (such as, for example, stages, thesis abroad, participation in the ERASMUS program, etc.).

Candidates who scored less than 12 points in the evaluation of their "titles" will be excluded from further evaluation.

Next the Evaluation Committee will proceed with the examination of the Statements of Motivation and the Research Project Proposals.

The maximum score for the evaluation of the Statement and Project is 40 points.

The Committee can directly contact the candidates for further details concerning the project proposal. In that case, the Committee will send an email to the address provided by the candidate who has to reply within 3 working days. If the candidate fails to do so, or the email bounces as undeliverable the Committee will proceed as if the candidate has been unable to provide the requested details, so that the final score on the project may be even reduced down to 0.

After having determined the final ranking of those candidates that are considered suitable for a PhD position within the doctoral course DRIMI, the Committee will evaluate if these candidates meet the requirements necessary for those fellowships that are linked to a specific research topic. The Committee will do so by taking into account the scientific interests of the Candidates (as stated in their application forms). In addition, the Committee may ask the scientific reference person of the specific research topic to act as independent referee on this issue. The referee reports will be attached to the final report of the Evaluation Committee. If no Candidates turn out to be deemed suitable for a specific topic, the corresponding position with or without fellowship is not awarded.

### **Annex C – Accepted international journals for the publication required to be admitted to the final examination**

The scientific publication referred to in requirement 3 for admission to the final examination must be in one of the journals indexed by the ISI or Scopus circuit, listed in the VQR document entitled “Classifiche Riviste Web of Science GEV 9 2007-2010” as belonging to Class 1 or 2 for at least one of the years, in any Collection Category (the document will be made available on the course website)

Because even according to VQR these classifications should not in any way be considered as exhaustive of the disciplines of interest, Thesis Advisors may present a motivated request to the Course Committee to integrate the set of journals defined in the preceding paragraph with other journals classified in Class 3 or not included in the published VQR lists but justifiably to be considered of a level equivalent to Classes 1 and 2 for the sole purposes of the DRIMI PhD course.

At the time of approval of this Regulation, journals in addition to those automatically identified by the first paragraph of this Annex, are as follows:

- International Journal of Acoustics and Vibration - ISSN 1027-5851
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Any subsequent additions to this list will be possible in the same manner in which it is always possible to amend the present set of Rules and Regulations.

## **Annex D – Research Areas defining the Sections and the Interdisciplinary Research Areas, currently active in DRIMI**

***WARNING: This annex is intended only to establish guidelines for the formulation of the call for applications, which however may vary from year to year upon interaction with the offices. Therefore, candidates applying for admission should not refer to the contents of the present annex but should refer exclusively to the text of the official call for applications.***

The aim of the DRIMI PhD course program is to train young researchers and professionals with the necessary and sufficient knowledge, skills, experience, independence and leadership that will enable them to assume responsibilities in technological, research, innovation, development, design, production, and logistic assignments in the industrial sectors. The scientific and technical operational independence is acquired through academic research, either application oriented, carried out in collaboration with private and public companies, or focused on the scientific development of basic technologies for industrial innovation oriented and sponsored by institutional funding bodies such as the Ministry of Scientific and Technological Research and the European Research Council.

The DRIMI PhD program is subdivided in four Sections which operate respectively in the following main **Research Areas**:

- A) Materials for Engineering;**
- B) Applied Mechanics;**
- C) Design and Management of Integrated Logistic and Production Systems;**
- D) Energy, Fluid&Thermal, and Manufacturing Systems and Technologies.**

In addition, various intrinsically interdisciplinary research areas are active, in particular in the framework of

**E) Systems and Technologies for Human and Environmental Health and Wealth** which falls within the broad research theme identified as strategic by the Brescia University for the next few years.

More precisely, the main **Research Topics** of these research Areas are as follows.

### **A) Materials for Engineering:**

The field of study and research of the Section covers the development and application of materials in different fields of Engineering, with structural and functional purposes. Therefore, the main applications are in the mechanical, civil, biomedical, electronics, energy fields, as well as in industrial design and preservation of cultural heritage. The interests cover, therefore, a wide spectrum of types of materials that are different for both their nature (metals, polymers, cements, ceramics, raw materials, etc..) and for their morphological-structural or dimensional characteristics (composites, nanocomposites, nanostructured materials, thin films, etc..). The activities are divided into the following areas:

- preparation of new materials;
- chemical-physical and morphological-structural characterizations;
- mechanical behavior;
- transformation technologies;
- structure/property relationships;
- modification processes (chemical, thermal, surface treatments, etc);
- environmental interactions;
- design procedures associated with the use of non conventional materials;

- raw materials.

### **B) Applied Mechanics:**

The area of interest of the Section includes machines, devices and systems for industrial and service application, with reference with the whole system and to its components (structural, actuation, measure, regulation and control).

The methodologies concern the study of the functional, kinematic, and dynamic, identification, modelling, regulation and control of complex systems and their representation, modeling and simulation focusing to the research advance as well as the development of techniques and procedure of design.

In addition, the aim of the section is the study of methods and technologies for information treatment devoted to the management and the automatic (also real-time) control of plants, processes and dynamic systems with application in several area of engineering and science.

The activity is mainly focused on:

- robotics and industrial automation;
- measuring, modelling, identification and analysis of systems;
- systems for regulation and control;
- biomechanics;
- advanced design of systems;
- mechanics of systems;
- vehicle mechanics;
- advanced manufacturing systems;
- elaboration and management of product documentation;
- relation between morphology, functionality, safety and perception.

### **C) Design and Management of Integrated Logistic and Production Systems:**

The main purpose of the Section is to train specialists giving them the best high-level, scientific and technical knowledge available today on the following main themes:

- the logistic and production systems (L&PSys), their endogenous factors about design, organization, economics, energy and management and their performance;
- the main problems related to configuration, sizing, and management of L&PSys;
- the ways in which the different L&PSys interact with each other, creating business networks and supply chains;
- the main problems related to the optimization and management of the transport systems, internal and inserted into the company distribution logistic network;
- the ways in which a L&PSys determines the operating and work conditions (environmental conditions, organizational conditions, etc..) and affect the external environment (environmental impact of processes and products);
- aspects and methods for the design and management of safety and ergonomics in industrial plants and production processes;
- the main problems and methods for controlling the reliability of industrial plant systems;
- advanced and traditional design methodologies, including quantitative techniques and modeling to support decisions related to the design and management of L&PSys;
- information and communication technology tools to support the design and management of L&PSys.

#### **D) Energy, Fluid&Thermal, and Manufacturing Systems and Technologies:**

The field of study and research of this Section are energy systems, energy technologies, mechanical technologies, methods of product engineering, heat transfer, fluid mechanics, thermodynamics. In the energy sector, the main research directions are toward the industrial product and complex and innovative systems of energy conversion. Also research on basic and fundamental aspects (chemical, physical and mathematical) without immediate effects on industrial application are supported and encouraged. In the mechanical technoligis sector, the main research directions are aimed to the use of industrialization techniques for new products design both with traditional and innovative methodologies, with a view of the ever-widening impact of non-conventional techniques and innovative materials processing. High priority in this research area is given to the following broad topics:

- experimental and numerical fluid dynamics and heat transfer;
- multiphase flows for industrial applications;
- energy conversion systems and power production technologies;
- processes and sensors for safety in the agro-food industry;
- cogeneration, micro-distributed, and hybrid power facilities;
- applied acoustics;
- thermodynamics of irreversible and non-equilibrium phenomena;
- multiscale methods for transport phenomena;
- production methods for biomedical devices;
- incremental forming;
- hydroforming.

#### **E) Systems and Technologies for Human and Environmental Health and Wealth**

The field of study and research of this interdisciplinary theme, which currently involves several scientific disciplines in the Department, focus on wealth and human and environmental health. Wealth is intended as the condition that comprehends all aspects that determine the quality of human life. Activities concern the developpent of methodologies and technologies that impact directly on these themes, such as biomedical (related to human health), energetic (energy efficiency, reduction and control of environmental impact), chemical (eco-friendly and sustainable materials and manufacturing techniques).

In this framework, in line with already ongoing research within national and international research grants, priority are being given to the following topics:

- development of materials and manufacturing technologies for biological applications (prosthesis);
- technologies for ash inertization;
- rehabilitation machines;
- low carbon energy technologies;
- renewables energies technologies (solar, wind, hybrid solar-fossil) ;
- water nano-filtration and purification.

Any subsequent amendments to this Annex will be possible in the same manner in which it is always possible to amend the present set of Rules and Regulations.