

**PHD PROGRAM IN**  
**MECHANICAL AND INDUSTRIAL ENGINEERING**

**Internal acronym: DRIMI**

**REGULATION**

**(Approved by the Board of Professors on date xxxx 2020)**

### **1. Designation**

The PhD program in Mechanical and Industrial Engineering (DRIMI) is dedicated to the preparation and scientific training of students admitted to the PhD Course.

### **2. Purpose of the Course**

The aim of the DRIMI program is to train researchers and professionals to acquire a high technical-scientific profile, along with a technical background, experience, independence and leadership, in order to assume responsibility roles in research institutions and industries.

Technical-scientific autonomy is developed through thesis elaboration in the Mechanical and Industrial Engineering Department's research areas.

### **3. The Program's Administrative Headquarters**

The Administrative office is the "U.O.C. Dottorati e Scuole di Specializzazione" of Brescia University.

### **4. Reference scientific and disciplinary areas**

The DRIMI's reference scientific areas are:

CHIM/07	Chemical foundations of technologies
FIS/01	Experimental physics
ICAR/03	Environmental and Health Engineering
ICAR/08	Science Of Construction
ING-IND/06	Fluid dynamics
ING-IND/08	Fluid machines
ING-IND/09	Energy and environmental systems
ING-IND/10	Industrial technical physics

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ING-IND/11	Environmental technical physics
ING-IND/12	Mechanical and thermal measures
ING-IND/13	Mechanics applied to machines
ING-IND/14	Mechanical design and machine construction
ING-IND/15	Design and methods of industrial engineering
ING-IND/16	Processing technologies and systems
ING-IND/17	Mechanical industrial plants
ING-IND/21	Metallurgy
ING-IND/22	Materials science and technology
ING-IND/35	Economic and management engineering
ING-INF/04	Automatics
ING-INF/07	Electrical and electronic measures
JUS/02	Comparative private law
MAT/05	Mathematical Analysis
SECS-P/06	Applied economy
SPS/09	Sociology of labour and economic processes

## 5. Course duration

The DRIMI training course lasts three years, with a potentially longer duration depending on the frame of the specific research agreement.

## 6. Reference Department

DRIMI is sustained by the Department of Mechanical and Industrial Engineering (DIMI) for logistics and support to research activities.

## 7. Structure and government bodies

The DRIMI government bodies are:

- The Board of Professors;
- The Coordinator;
- The Executive Board.

### *7.1 Board of Professors*

Members of the Board are confirmed annually. Its composition is updated by taking into account:

- Legislation;
- The doctorate's scientific and organization needs;

- Representativity of the DIMI research areas;
- Scientific productivity;
- External experts.

The composition of the Board of Professors must be approved by the Board each year.

The Board is convened at least once a year and whenever the Coordinator or the Executive Board deem it necessary. The Board is also convened if requested by 25% of Members.

### *7.2 Coordinator*

The Coordinator must be a Professor on the Board. She/he remains in office for three years and can only be re-elected once. The Doctorate's administrative direction is under the responsibility of the Coordinator, who convenes and chairs the Board of Professors and the Executive Board. The Coordinator may delegate specific matters to a member of the Board.

The Coordinator may adopt urgent measures that must be approved by Board Members in the subsequent meeting or by email.

### *7.3 Executive Board*

The Executive Board, composed of the Coordinator and Research Area Representatives, aims to assist the Coordinator in administrative functions and in directing DRIMI's scientific activities.

The Executive Board is convened by the Coordinator or by Members and is considered valid if at least three members are present. In the case of the Board's explicit authorization, decisions are taken if the majority of Members agree.

The Executive Board is proposed by the Coordinator each year and approved by the Board.

The Board can delegate specific tasks to the Executive Board.

## **8. Research Areas**

Research Areas of interest for the Doctorate are:

### 1. Energy Systems and Technologies:

- Industrial Technical Physics;
- Acoustics;
- Fluid dynamics
- Fluid machines and systems for energy conversion.
- Technologies and processing systems;

### 2. Applied and Automatic Mechanics:

- Systems of Control;
  - Automotive Engineering and Design;
  - Design and methods for Industrial Engineering;
  - Mechanics Applied to Machines;
  - Mechanical and Thermal Measurements;
  - Mechanical Design and Construction of Machines;
  - Vision Systems for Mechatronics;
3. Materials:
- Chemistry for Technologies;
  - Variational Methods for Partial Differential Equations;
  - Fundamental and Applied Nuclear Physics;
  - Metallurgy;
  - Materials Science and Technology;
4. Production systems and socio-economic systems:
- Industrial Mechanical Plants;
  - Economic and Management Engineering;
  - Sociology of Economic and Labour Processes.

Each Board Member must belong to one of the DRIMI research areas. Research is carried out in accordance with the Strategic Plan approved by the Mechanical and Industrial Engineering Department.

## 9. Functions of the Board

The Board of Professors has the following functions:

- Annually, provides information on the number of positions available;
- Proposes and organizes didactic activities;
- Appoints a tutor from the Board to the PhD student, as well as an advisor and the experts on the committee who will follow her/his activities;
- Approves the research proposals;
- Evaluates PhD student Annual Reports;
- Approves PhD students' teaching activities;
- Establishes training and research activities carried out by each PhD student;
- Admits the PhD student to the following year and sends the thesis for evaluation;
- Proposes the possible exclusion of a PhD student to the Rector;
- Decides on the annual update of the Board's composition and the new cycle's activation;
- Defines the selection criteria for PhD candidates;
- Defines advertising activities, available positions and scholarships;

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- Approves changes to selection rules;
- Defines research credits (i.e. CFR) earned by PhD students;
- Decides on the PhD website's organization and assigns its organization and update to student representatives.

The Board may delegate some of its functions to the Executive Board.

Two PhD student representatives are elected annually for each year. They are invited by the Board to discuss the didactic plan and organizational issues. The Board can also invite experts to support PhD activities.

Board Meetings shall only be valid if a majority of its members are present (Members whose absence is justified are considered present). Decisions are taken by majority.

## **10. Advisor, Tutor and Thesis Committee**

The Board entrusts each PhD student to one or more Advisors. The Board also appoints a Tutor chosen from among Board members for each PhD student. The Advisor may not necessarily belong to the Board.

By the end of the first year, the Board appoints a Thesis Committee for each PhD student, composed of at least three experts including the Advisor and the Tutor. Committee members undertake to guide and evaluate the PhD student's activities.

Advisors and Tutors are assigned to the PhD student during the first month of activity.

The Advisor and Tutor's tasks are to:

- Identify the student's training needs;
- Follow training and research activities;
- Countersign the research proposal;
- Verify the student's progress and inform the Coordinator in case of problems;
- Propose, share and endorse student requests

## **11. PhD student's research activities**

The aim of the research activity is to contribute with originality to the progress of the state-of-the-art related to a specific research project. Key milestones are to:

1. Acquire a deep knowledge of the state-of-the-art and aspects that need to be improved;
2. Define the research program in collaboration with his/her Advisor;

3. Acquire the ability to write papers in English. The acceptance of at least one scientific publication is the recognition of the originality of results achieved;
4. Acquire the ability to communicate in English. The student must discuss her/his research activities in at least one international conference.

## 12. Curricula

DRIMI comprises three curricula: general, industrial and international.

The aim of the **general** curriculum is to provide the student with solid basic scientific knowledge, autonomous skills in research design and execution and possible technological applications. Research activity for the general curriculum focuses on research topics agreed between the PhD student and one DRIMI research group, under the guidance of the student's Advisor. At the end of the three-year period, the student must demonstrate his/her ability to present the research to the international scientific community.

The **international** curriculum gives students the opportunity to carry out research activities in close collaboration with universities and research centers in foreign countries. Inter-university cooperation agreements are included with a view to developing management and co-protection, and to conduct research at international institutions and centers collaborating with the Department of Mechanical and Industrial Engineering. Students must spend at least twelve months in foreign institutions. Therefore, this curriculum provides an excellent opportunity for close interaction with top international research laboratories.

The aim of the **industrial** curriculum, usually funded by companies or external bodies, is to provide a solid knowledge on issues of interest to the Department and the sponsor. For the industrial curriculum, experimental work is aimed at research topics and training courses, also agreed with the contact persons of the grants' external funding bodies, under the guidance of the Advisor appointed by the Board. At the end of the three years, the student must demonstrate that she/he has achieved the results defined by the training plan (for example, patents, development of prototypes, new materials or products).

In all curricula, the basic concepts of economics, finance and protection of intellectual property needed for the research project's management are acquired.

## 13. Conduct and evaluation of research

By the ninth month of the first year, the student must send the Research Program to the Board for approval, countersigned by the Advisor.

By the ninth month of each year, the student must send the Advisor, the Committee and the Coordinator a draft of the report on his/her activities and eventually the proposed changes to the Research Program approved by the Advisor.

At the end of the year, the student reports her/his activities to her/his Committee during a public discussion. The Thesis Committee proposes the student's admission to the following year, or her/his exclusion, to the Board on the basis of the report and the discussion.

Suspension periods are regulated by University Regulations.

#### **14. The training course**

The steps of the PhD program are the following:

- a) Preparatory training, aimed at guaranteeing the required knowledge of doctoral students, while taking their background into account.
- b) Training developed according to an individual plan. Activities include participation in courses, conferences and congresses offered by other Universities, scientific associations, etc.
- c) Research, as the central activity characterizing the program under the Advisor's supervision. In the first 9 months of the first year, the student is required to identify the main targets of her/his research. The student must present the developed and planned activities to the Committee and the Board on an annual basis.
- d) Updating the Research Program, if this changes significantly.
- e) Internships at internationally-recognized research institutes. The training and research activity is mainly carried out at the University of Brescia. The student usually has to spend at least three months at other research institutes, preferably abroad. It is the student's responsibility to inform the Advisor of the research carried out outside the Department.
- f) Internships can be carried out in companies or other institutions with which collaboration agreements have been signed. It is the Advisor's responsibility to coordinate activities and to verify that the student pursues Research Program targets. The industrial Tutor must be identified in order to verify the activities carried out during this stage.
- g) External activities and/or teaching support are regulated by University Regulations.
- h) Doctoral thesis, to be written in Italian or English, with an abstract in English or Italian, respectively, which constitutes the proof of the research activity carried out during the course. Deadlines are defined by the Board.

Research credits (CFR) acquired during the Training Course

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“Research credits” (CFR) are defined as follows:

- a) The PhD student must acquire at least 180 CFR (approximately 60 each year). This is a requirement for admission to the Final Discussion;
- b) At least 15 CFR must be acquired by following seminars and courses;
- c) At least 120 CFR must be acquired for research and laboratory activities;
- d) A maximum of 15 CFR can be recognized for preparatory training activities.

Training activities are mainly to be carried out in the first two years.

CFR for seminars and courses are attributed as follows:

- a) Courses organized within the DRIMI, Summer Schools or refresher schools (1 CFR every 6 hours of lectures);
- b) Single seminars or those organized in cycles (maximum 0.5 CFR per seminar);
- c) Undergraduate courses (maximum 0.8 CFR per CFU).

CFRs are approved by the Board.

CFRs for research and laboratory activities are acquired through:

- a) Research activities (1 CFR per 25 hours of activity, minimum 30 CFR per year);
- b) Research periods in foreign institutions (up to 5 CFR per month);
- c) Research activities in laboratories or industrial research centres (up to 5 CFR per month).

## **15. PhD student representatives**

Every year, students elect two representatives for each cycle. Representatives are invited to attend Board meetings and are consulted about educational and organizational issues.

## **16. Evaluators**

Three months before the end of the course, the Thesis Committee identifies two international experts who will evaluate the theses and propose them to the Board.

## **17. Admission to the Final Examination**

Administrative deadlines for the final examination are established annually by the University. Before sending the thesis for evaluation, the student must demonstrate that she/he has published (or at least obtained formal acceptance) one research paper related to her/his doctoral activities, in which



she/he appears as the first author. The publication must be placed on a recognized scientific journal (excluding the proceedings of congresses) indexed in Scopus or Scimago. In addition, she/he must have participated as a speaker in at least one International Congress.

If the student does not achieve these results, the Board may admit the candidate to the final discussion if she/he can provide a proper explanation in a formal letter why she/he could not achieve the expected results, countersigned by the Advisor.

### **18. Final Examination**

The Committee, appointed in accordance with University Regulations, interviews the candidate. The Coordinator provides the Committee with a report on the candidate's activity. The candidate presents her/his research during the first 35-40 minutes of the interview. The interview is held in English if a Member of the Committee does not speak Italian. The ensuing discussion usually lasts for 20-25 minutes.

### **19. Collaborations**

Training may also include internship activities in public or private institutions, in Italy or abroad, A specific agreement between the host institution and the University of Brescia must be signed.

### **20. Code of ethics**

The behaviour of members of the doctoral college and of doctoral students must comply with the University of Brescia's code of ethics.

### **20. Amendments**

Any amendment to this Regulation shall be approved by the Board.

**In the case of inconsistency or discrepancy between English and Italian versions of this document, the Italian version shall prevail.**