Mathematics

PhD Programme
2016-2017

The purpose of the PhD program in Mathematics is to introduce the students to mathematical research, both pure and applied. It educates and trains the future researchers in public and private research center.

A PhD in Mathematics will be capable of developing independent mathematical research, either theoretical or motivated by real life applications.

The PhD in Mathematics prepares its students for professional and academic careers in Mathematics and its applications.

To attain this goal, the doctoral program provides:

- a broad and high-level preparation in mathematics;
- the opportunity to deepen mathematical understanding and abilities through scientific research;
- participation in a research program in promising areas of mathematics or its applications in an interdisciplinary setting.

The high quality of the doctoral program is guaranteed by the excellence of the research performed in the department and by the wide-ranging collaborative relationships mantained by researchers in the Department of Mathematics

PhD Programme in Mathematics

FACULTY RESEARCH AREAS

Partial differential equations

Calculus of variations

Probability theory

Algebraic geometry

Commutative algebra

Complex analysis

Algebraic topology

Combinatorics

Group theory

Statistical Mechanics

Dynamical systems and ergodic theory

Numerical methods

Mathematical finance

Numerical methods for inverse problems and image processing

The PhD Programme in Mathematics of the University of Bologna is a 3-year full-time programme. It aims to train research candidates who want to become leading scholars in pure and applied research at top rated universities and industries.

The PhD program generally lasts for three years. It is divided into a first year, aiming at completing and broadening the mathematical culture of the students through courses and guided readings, and in the remaining two years, devoted to research and culminating in the PhD thesis, which must be an original contribution of adequate scientific importance.

During the first year students have to attend three courses, generally delivered in english, from different areas of pure and applied mathematics. In addition, they attend the seminars of the cycle "Topics in Mathematics" provided by the Department and also the seminars of their own research area.

At the end of the first year, PhD students have to choose an advisor that will follow them during the research period, which will last for the following two years.

In addition, throughout the whole program PhD students will perform laboratory activity with mathematical software, will follow courses to improve specific skills, as for example ability of using library resources, giving a talk and grant writing skills. In order to widen their view of the mathematical research, students in the doctoral program will be encouraged to participate in specialistic conferences all around the world. In particular, every student has to spend at least three months during the three years of the program, working or studying abroad or participating in international schools or meetings. As a proof of the international spirit of the Department, the PhD course will be complemented by a Marie Curie ITN mobility project with 9 partners from different European countries. This will favour the mobility of all students and the presence of many foreigners professor, who will give courses and seminars.

As long as research opportunities, the PhD program also offers collaborations with many industries and companies, which provides fellowships.

The PhD Programme in Mathematics prepares candidates for research and teaching careers at leading academic institutions, as well as at private and public research institutions.
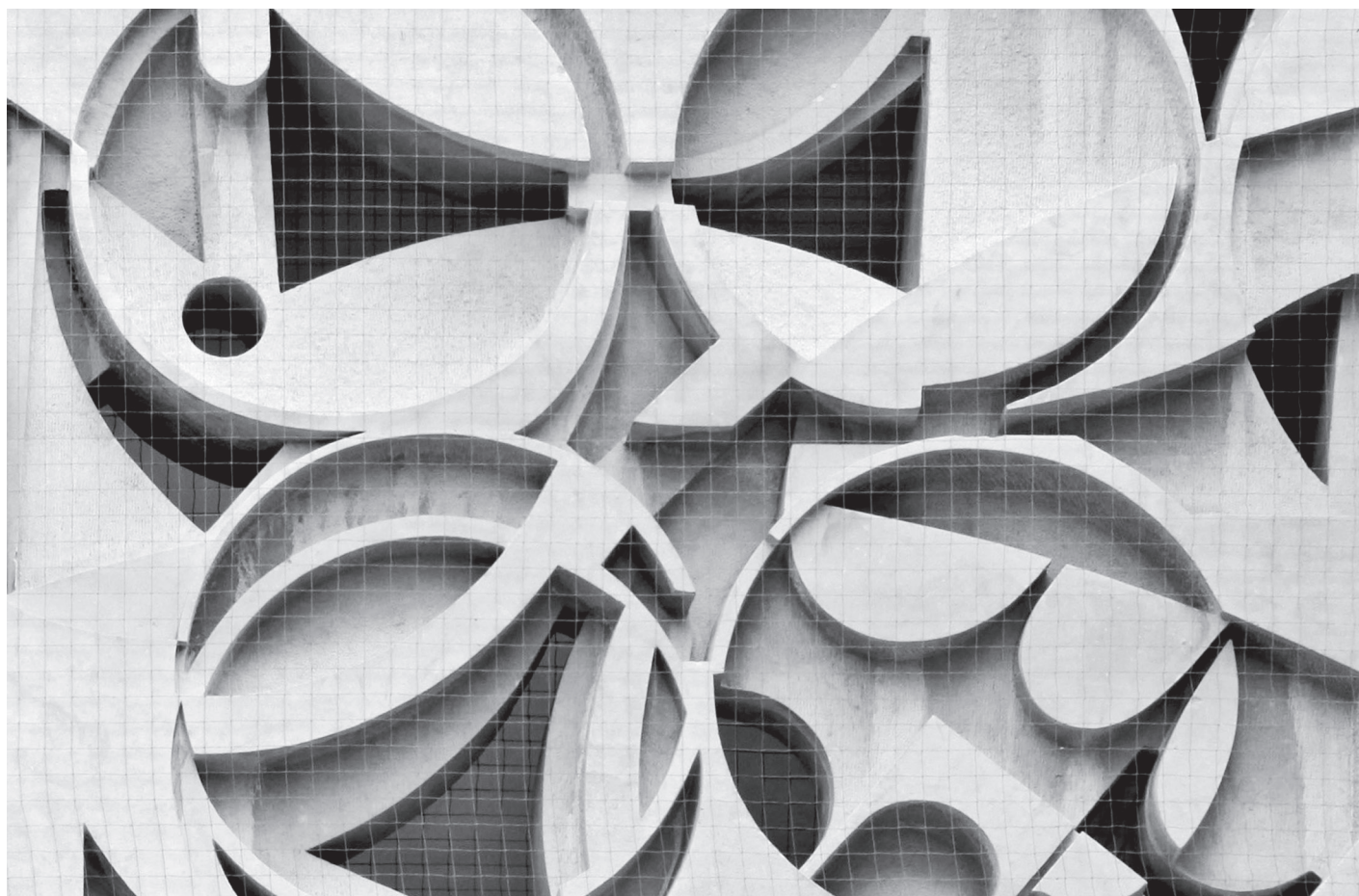
PROGRAMME STRUCTURE

First year	Second and Third Year
Courses	*Periodic seminars*
• 3 compulsory courses of 30 hours each • Seminars of the cycle "Topics in mathematics	• Periodic seminar in Mathematical Analysis "Bruno Pini" • Periodic seminar in Algebra and Geometry • Local Training activity for MAnET Project • Periodic seminar in Mathematical Physics • AM^2 seminar in applied Mathematics • Periodic seminar in Financial Mathematics • Periodic seminar in Numerical Analysis

* Upon approval of the PhD Programme Committee, other elective courses can be taken from other PhD and Master programmes of the University of Bologna or from Summer Schools offered by our University or other universities.

THE PhD TEAM

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FACULTY MEMBERS

Andrea Bonfiglioli
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Marco Lenci
André Martinez
Luca Migliorini
Alberto Parmeggiani
Andrea Pascucci
Fiorella Sgallari
Valeria Simoncini

MATHEMATICS: THE LANGUAGE OF SCIENCE AND TECHNOLOGY

Mathematics is unique among languages in its ability to provide precise expression for every thought or concept that can be formulated in its terms.

Real world issues pose problems that can be studied by formulating and analyzing mathematical models. In some cases applications may lead to new mathematics, and a new branch of the science is born, in other cases abstract theory finds unexpected practical purpose. Especially in our age, with an increasing development of technology that permeates most of our lives, a mathematical knowledge is essential.

Physicists, engineers, computers scientists, statistics experts, physicians and many others use mathematics everyday. What makes a Mathematicians different from them is that they are look to things without prejudice or preconceptions in order to see a problem with a mathematical point of view, to find a solution in such an environment and translate it back to practice. This is why study of mathematics can lead to a variety of exciting professional careers. Mathematical analysis and computational modeling are important for solving some of the most pressing problems of our time - new energy resources, climate change, risk management, epidemiology, to name a few. We must strive to maintain our technological edge;

mathematical skills will be crucial to this effort.

Some more specific business positions include portfolio analysis, design studies, statistical analysis, computer simulation, software design and testing, and other areas of operations research. There are extensive opportunities for mathematics in finance, the actuarial fields, and economic forecasting.

As a proof of this, the Department has collaborations with prominent companies in different areas such as Datalogic, Magneti Marelli, Marposs, Inail, G.D (Coesia Group).

Also, many mathematicians are part of research teams in public and private institutes. Their work often deals with the development of new technology, such as research in basic physics,application to medicine and software development. Numerical simulation, such as weather and climate forecasting, depends heavily on the use of supercomputers.

Practical considerations aside, there is the pleasure of learning, applying, and creating Mathematics. Working on research problems is exciting; solving difficult problems successfully is, for many, satisfaction enough.

GRANTS

All admitted candidates will receive a financial support package which includes a grant of approximately 13,650 Euros (yearly) to cover living expenses during the 3 years of the de-gree. On top of this, PhD candidates will receive up to 2,700 Euros to cover research ex-penses as well as a grant increment (up to 2,050 Euros) if they spend a visiting period at a prestigious international university.

The University of Bologna PhD in Mathematics offers up to 5 fully funded grants.

IMPORTANT DATES

Application opening date: 19 April 2016
Application closing date: 18 May 2016

CONTACTS AND INFORMATION

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THE UNIVERSITY OF BOLOGNA

Born in 1088, and considered to be the oldest university in the Western world, the **University of Bologna** has been student-centred, attracting prominent figures from science and the arts. Today it is a leader in Europe and famous for its beauty and integration with the city. Its teaching catalogue is diversified and tailored to the needs of present-day society: over **200 degree programmes**, over **70 professional masters** a **45 PhD programmes**, **41 specialisation courses**, all among its 33 Departments, 11 Schools and over 81,000 students. A further 5,000 are candidates for its PhDs and 3rd cycle programmes. Bologna has always favoured a multi-disciplinary, cross-cultural approach; it invests in international, multicultural training, research and services. It has formed knowledge alliances with industry and public/private organizations, and is a hub of international networks.

Besides the five campuses (Bologna, Cesena, Forlì, Ravenna, Rimini), there is an overseas branch (Buenos Aires) coordinating activities with Latin America. Beyond its close European links, Alma Mater enjoys multiple international connections with North America, Africa, Asia and Australia. It is a public, independent and pluralistic institution.

The **Department of Mathematics** has a prominent role in international research in different areas. The research of the Department involves: Logic, Geometry and Algebra, Mathematical Analysis, Probability e Statistics, Mathematical Physics, Numerical Analysis, Mathematical Methods for Economics. The teaching offer of the department is one of the widest of the University: our professors are responsible for about 65 in both Bachelor and Master degrees in the Schools of Sciences – Engineering and Architecture – Economy, Management and Statistics.