Ph.D School in Mathematics

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History

In Italy, before the year 1980 there was only one university degree awarded, namely, the "laurea". After a study of four years, the students had to write a dessertation consisting of an original work, the "tesi di laurea": which required about an year of work, and there were no postgraduate studies as such, except for the "Perfezionamento" of the Scuola Normale Superiore of Pisa and the courses of the "Alta Matematica" at Rome.

At the beginning of the 80's the "Dottorato di Ricerca" was officially established by law. About ten Ph.D. programmes in Mathematics were set up, mainly at some of the major Italian Universities (Roma I, Roma II, Milano, Torino, Bologna, Padova, Pisa, Firenze, Trento, Messina, Napoli). Some of the "peripherical" universities joined with these major centers to co-sponsor the Ph. D. degree as associate Universities.

In addition, one should also consider the somewhat special Ph. D. programmes of the Scuola Normale, the Institute of Alta Matematica, and the SISSA at Trieste.

The Ph. D. programme in Mathematics of Pisa, which included also the Universities of Bari, Parma, Lecce and Ferrara as associated Universities, was established in the year 1983.

The institutional structure of all the programmes was partially centralized, for instance all the theses had to be defended before a national panel of examiners, in Rome, while organization of courses and periodical evaluations were left to the single universities.

At the end of nineties, a new national legislation under the title "Autonomy of the Universities" was introduced, which allowed, in particular, each University to institute and manage financially its own Ph. D. programmes. As a consequence, the

previously existing joint cosponsored involving different Universities were abandoned,
With, as a consequence, a proliferation of Ph. D. schools, of various kinds and sizes.
At the present there are in Italy almost 30 Ph. D. programmes in Mathematics, some of which with a very restricted scope.

Aim

The aim of the Ph. D. programme in Pisa is to provide to well motivated graduate students a qualified preparation to scientific research, both in pure and applied mathematics, as well as to relevant responsibilities in the industrial or economical world.

In the last 15 years, about 80 students from the Ph. D. programme of Pisa have obtained the Ph.D. degree: more than a half of them now have permanent positions in an Italian University, and another about ten of them have teaching positions in high schools.

Structures

The Ph. D. programme is organized by the Department of Mathematics "Leonida Tonelli", where it has its institutional and administrative seat, and by the Department of Applied Mathematics "Ulisse Dini".
All the teaching staff of the two Departments, together with two graduate student representatives, constitute the "Consiglio di Dottorato".

The duration of the graduate studies is of three years. Every year the University of Pisa offers 6 to 7 fellowship grants consisting of 10.000 Euros (net) per year.

The Department "L. Tonelli" provides the students with offices equipped with personal computers and telephone facility. The students have free access the Computer Center of the Department and the Library.

A large part of the activities of the two departments, i.e., seminars, advanced courses, research meetings, are specially devoted to the Ph. D. students.

Admission

The annual entrance examination consists in a written test, with several mathematical problems, and an oral colloquium. The board of examiners should necessarily include a professor from a University other than that of Pisa.

The selection has been rather strict: in the last years the successful entrants were less than the 20% of the candidates who had applied.
For the current year entrance competitions we have received more than 50 applications against 7 positions of fellowship grants.

It should be emphasized that a good part of our students comes from universities different from the University of Pisa.

Activities

The first year of the Doctoral Course is mainly devoted to the general formation. The students are asked to follow several advanced courses, on topics not necessarily affine to their previous preparation.

The second year is partly devoted to more specific courses, and partly to the preparation of a project of thesis. At the end of the first semester of the second year, the students are required to pass an examination concerning their activity. The third year is entirely devoted to the preparation of the thesis. Most of these courses are held by mathematicians of international reputation. Some of the lecture notes of these courses have lead to publications in our collection of the "Quaderni del Dottorato".

Finally, all the students have also the possibility to make some teaching experience, by way of giving a contribution to the tutorial work for the undergradued courses.

Relationships with other institutions

Since its beginning, the Ph. D. programme in Mathematics of Pisa has had a preferential links with the Perfezionamento of the Scuola Normale.
Many of the courses are common, several students of one of the two institutions prepare their thesis having an advisor from the other institution.

Besides this, our Ph. D. programme maintains scientific relations with some foreign Universities, such as Paris VI, Orsay, Dijion, Montpellier, Rennes, Strasbourg, Complutense of Madrid, Rutgers, Osaka, Tsukuba.

The students are encouraged to spend some time in foreign Universities or Institutions. During these periods their fellowship is increased.

Scientific expertise

The two departments have active several research groups, which have a good and adequate scientific preparation to guide the students during their graduate studies, and to assist while preparing their Ph.D. thesis.

Here is a list of the main research areas covered:

Commutative Algebra, Number Theory, Computational Algebra, Algebraic Geometry,
Real Algebraic and Analytic Geometry, Complex Analysis, Real and complex Dynamical Systems, Hyperbolic Geometry, Geometry and Topology in low dimension, Algebraic Topology, Nonlinear Analysis, Calculus of Variations, Hyperbolic Equations, Numerical Analysis, Biomathematics, Statistics and Probability Theory, Mathematical Finance, Mathematical Physics, Fluid-dynamics, Celestial Mechanics, Operations Research, Didactics and History of Mathematics, Mathematical Logic.

Theses

All the theses should necessarily include some original results. Some months before the discussion, the theses are submitted to two external referees of international reputation, who are required to write a detailed report on the originality and the scientific contribution of the results presented in the thesis.

Usually the preparation of the thesis requires an additional year after the three years covered by the grant.

The board of examiners is composed by 5 members, most of them not belonging to the Ph. D. programme in Pisa.

Further developments and problems

The participation of our Ph. D. programme in the Scuola Galilei provides us with new opportunities.

In particular, it is easier to attract foreign students. Moreover, the interdisciplinary aspects of the Ph. D. programme will be enhanced. Finally, an increased financial support could help us in giving a (partial) solution to the problem of the housing for the students.

The main problem, however, is that of attracting good students, taking into account that the student mobility in Italy becomes less and less (also in view of the number of Ph. D. programme available), as well as the number of good students interested in mathematical research.