Summer School of Mathematics for Economics and Social Sciences

17 - 21 September 2012

The **"Summer School of Mathematics for Economics and Social Sciences"** aims to improve the knowledge of mathematical methods among graduate students in economics and social sciences, with a focus on those techniques which albeit widespread in use are not properly covered in typical graduate programs. The School is an interdisciplinary venue intended to foster the interaction of people coming from the too often separated communities of mathematical and social scientists. It is organized by the *Mathematics Research Center "Ennio De Giorgi"* and supported by the *International Doctoral Program in Economics of the Scuola Superiore Sant'Anna*.

Dates: from 17 to 21 September2012

Venue: Conservatorio di Santa Chiara, San Miniato, Italy

Topics: Structural stability; Codimension one bifurcations of vector fields; Codimension one bifurcations of maps; Introduction to codimension two bifurcations

Lecturer: Florian Wagner, CeNDEF, University of Amsterdam

Participation

The participation is subject to a selection. Only 20-25 positions are available. Financial support for board and accommodation will be provided.

On-line applications should be made at http://www.crm.sns.it/event/256/financial.html All applications must include a CV that shall be sent by e-mail to crm@crm.sns.it. Applications without a CV. will not be considered.

Deadline for the application: **5 August 2012**

Decision on the application will be communicated: **10 August 2012**.

Scientific Committee

Giulio Bottazzi (Scuola Superiore Sant'Anna), Giorgio Fagiolo (Scuola Superiore Sant'Anna), Davide Fiaschi (Università di Pisa), Stefano Marmi (Scuola Normale Superiore)

Syllabus of the course

<u>Introduction</u>

- Review of linear theory

<u>Structural stability</u>

- Equivalence classes of linear dynamics

- Differentiable and topological equivalence

- Hartman-Grobman theorem

- Structural stability

- General notion of bifurcation

<u>Codimension one bifurcations of vector fields</u>

- Saddle-node bifurcation

- Normal forms

- Hopf bifurcation

- Invariant manifolds

- Homoclinic and heteroclinic bifurcations

- Symmetry

- Pitchfork bifurcation

<u>Codimension one bifurcations of maps</u>

- Poincaré section

- Saddle-node bifurcation

- Neimark-Sacker bifurcation

- Resonances

- Homoclinic tangencies

- Horseshoes

<u>Introduction to Codimension two bifurcations</u>

Topics considered prerequisite for the course

complex numbers, eigenvectors, eigenvalues and diagonalisation, Taylor's theorem, implicit function theorem, linear ODEs and one-dimensional autonomous nonlinear ODEs.

Course timetable and teaching load

From Monday to Thursday

9:00-12:00   teaching with main lecturer

14:00-15.30   exercises with the instructors

15.30-17:00   individual exercises

Friday

9:00-12:00   teaching with main lecturer

14:00-16:00   final test

Up to date information about the program of the

Summer School of Mathematics for Economics and Social Sciences

can be found at http://crm.sns.it/event/256/