BULLETIN

INTERNATIONAL CENTER FOR MATHEMATICS

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Contents

Coming Events

Thematic Term on Mathematics and Engineering

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Dates

June-September 2003

The **Thematic Term** for 2003 will be dedicated to Mathematics and Engineering. The application of mathematics to engineering is crucial to knowledge and the development of science. The main objective of the thematic term for 2003 is to improve and emphasize the interdependence between the most recent and important research fields in mathematics and the most important fields of contemporary engineering: informatics engineering, chemical engineering, mechanical engineering, civil engineering and electronics engineering.

The thematic term 2003 consists of four events. The first event is devoted to mathematics and informatics engineering and focuses on soft computing and complex systems. The second event deals with modelling and simulation in chemical engineering. The third event is related to modelling and numerical simulation in continuum mechanics. The fourth event is concerned with mathematics and telecommunications.

Each one of these events is an Advanced School and Workshop, where short courses, lectures and invited talks will be given by well-known invited scientists. So it is expected that the thematic term 2003 will attract a large number of postgraduate students, mathematicians and engineers, interested in contributing to the development of mathematics and its applications to engineering.

The programme of events is the following:

23-27 June: Workshop on Soft Computing and Complex Systems

Organizers

António Dourado Correia (Univ. Coimbra), Ernesto Jorge Costa (Univ. Coimbra), José Félix Costa (I. Superior Técnico - Lisbon), Pedro Quaresma (Univ. Coimbra).

Aims

The main scientific goal of the workshop is to introduce recent developments in mathematical techniques applied to complex engineering problems. In particular, the workshop will focus on different aspects of the area called soft computing, including fuzzy and conexionist systems, evolutionary computation, artificial life and complex systems.

Harnessing complexity is an important aspect of today problem solving. Complexity may be due to the presence of uncertain information or because the regularities of a system, we are trying to understand, cannot be briefly described. We will discuss recent developments in dealing with complexity, by means of introducing the methods and their sound mathematical foundations, as well as through the work of some difficult problems.

The workshop will be held at the Mathematics Department - University of Coimbra.

Lectures

Multi-criteria Genetic Optimisation

Carlos Fonseca, University of Algarve, Portugal

Neural Computation and Applications in Time Series and Signal Processing

Georg Dorffner, Department of Medical Cybernetics and Artificial Intelligence, University of Vienna, Austria

Analogic Computation

José Félix Costa, Department of Mathematics, Technical University of Lisbon, Portugal

State-of-the-art recurrent neural networks, with applications

Juergen Schmidhuber, IDSIA- Instituto Dalle Molle di Studi sull'Intelligenza Artificiale, Switzerland

Neuro-Fuzzy Modelling

Intelligent Control

Robert Babuska, Delft University of Technology, Holland.

For more information on this event, please visit the site

http://hilbert.mat.uc.pt/∼softcomplex/

30 June - 4 July: Workshop on Modelling and Simulation in Chemical Engineering

Organizers

Alírio Egídio Rodrigues (Univ. Porto), Paula Oliveira (Univ. Coimbra), José Almiro Meneses e Castro† (Univ. Coimbra), José Augusto Mendes Ferreira (Univ. Coimbra), Maria do Carmo Coimbra (Univ. Porto).

Aims

The main objective is to bring together mathematicians and chemical engineers to improve the understanding of the problems encountered in process engineering and tools available to solve them. To reach that objective the Workhop is designed:

- To provide the basis for mathematical modeling of chemical engineering systems
- To present some numerical methods to solve model equations in particular in cases of steep moving fronts
- To stress the use of dynamic simulators
- To introduce optimization techniques

The workshop will be held at the CIM headquarters: Complexo do Observatório Astronómico - Universidade de Coimbra.

Short Courses

Modeling in Chemical Engineering

S. Sotirchos and A. Rodrigues, University Rochester, USA and LSRE-FEUP, University of Porto, Portugal

Numerical Simulations with Advection-Diffusion-Reaction Systems

W. Hundsdorfer, Center for Mathematics and Computer Science, The Netherlands

Optimization and Control of Chemical Processes

N. Oliveira, University of Coimbra, Portugal

Invited talks

Adaptive finite element solutions of dependent partial differential equations using moving grid algorithms

J. M. Baines, Department of Mathematics, University of Reading, United Kingdom

Inorganic chemistry and mathematics

R.Mattheij, Department of Mathematics and Computer Science, Tech. University of Eindhoven, The Netherlands

Sensitivity Analysis for Differential-Algebraic Equations and More

Linda Petzold, UC Santa Barbara, USA

Splitting Methods for Advection-Diffusion-Reactions Problems

J. G. Verwer, Center for Mathematics and Computer Science, CWI, Amsterdam, The Neterlands

Numerical and Computational Challenges in Environmental Modeling

Z. Zlatev, National Environmental Research Institute, Denmark

For more information on this event, please visit the site

http://www.fe.up.pt/lsre/cim2msce/workshop.html

14-18 July: Advanced School and Workshop on Modelling and Numerical Simulation in Continuum Mechanics

Organizers

Luís Filipe Menezes (Univ. Coimbra), Isabel Maria Narra de Figueiredo (Univ. Coimbra), Juha Videman (I. Superior Técnico - Lisbon).

Aims

The scientific goals of this event are the following:

- to present some of the most important recent fields of research in mathematics and its applications to civil and mechanical engineering
- to promote the interdisciplinary aspects of the field by establishing contacts between mathematicians and engineers
- to provide an opportunity for Portuguese scientists to present and discuss their research work.

This event will take place at the Department of Mechanical Engineering - University of Coimbra.

Short Courses

Numerical analysis of discrete schemes approximating grade-two fluid models. Recent results and open problems

Vivette Girault (Université Pierre et Marie Curie, France)

Shape optimization

Patrick Le Tallec (École Polytechnique, France)

Advances in the finite point method for meshless analysis of problems in solid and fluid mechanics

Eugenio Oñate (CIMNE, Universitat Politècnica de Catalunya, Spain)

Mathematics and numerics of shell problems

Juhani Pitkäranta (Helsinki University of Technology, Finland)

Computational mechanics of solid materials at large strains

Cristian Teodosiu (Université de Paris Nord, France)

For more information on this event, please visit the site

http://www.math.ist.utl.pt/wmnscm/

8-12 September: Mathematical Techniques and Problems in Telecommunications

Organizers

Carlos Salema (I. Superior Técnico - Lisbon), Joaquim Júdice (Univ. Coimbra), Carlos Fernandes (I. Superior Técnico - Lisbon), Mário Figueiredo (I. Superior Técnico - Lisbon), Luís Merca Fernandes (I. P. Tomar).

Aims

The goals are three fold. Firstly we will try to identify and possibly provide solutions for a number of mathematical problems in the field of Telecommunications. Secondly we intend to disseminate among telecommunications engineers some mathematical techniques which are not widely known in this community even if they are being applied in modern communication techniques. Finally we would like to improve mutual understanding and recognition between mathematicians and telecommunication engineers, one of the heaviest users of mathematical techniques in the field of engineering.

This event comes in the follow-up of rather successful, even if less ambitious event, "Matemática em Telecomunicações: Que Problemas?" with similar objectives organized by IT in 1997.

This event will take place at the Instituto Politécnico de Tomar.

Invited Lectures

Combinatorial Optimization in Telecommunications

Mauricio Resende, ATT, USA

Transforms, Algorithms and Applications

Joana Soares U. Minho, Portugal

Controllability of PDE's and its Discrete Approximations

Enrique Zuazua U. A. Madrid, Spain

Evolutionary Computing

Eckart Zitzler SFIT, Switzerland

Stochastic Processes in Telecommunications Traffic

Ivete Gomes CEAUL, Portugal

For more information on this event, please visit the site

http://www.lx.it.pt/mtpt/

Third Debate on Mathematical Research in Portugal

Porto, 25 October 2003

Organizers: José Ferreira Alves (Univ. Porto), José Miguel Urbano (Univ. Coimbra).

This event will take place at the Pure Mathematics Department, University of Porto.

Themes

- Evaluation and Funding
- The Challenge of Excellence
- Mathematical Research in Industry

For more information on this event, please visit the site

http://www.fc.up.pt/cmup/jfalves/debate/

CIM News

ERCOM

CIM has been for some years a member of ERCOM, a network of European Research Centres on Mathematics.

ERCOM is an European Mathematical Society committee consisting of Scientific Directors of the member Centres, or their chosen representatives. Only centres for which the number of visiting staff substantially exceeds the number of permanent and long-term staff and that cover Mathematical Sciences broadly are eligible for representation in ERCOM. The eligibility of centres is decided by the EMS Executive Committee.

ERCOM aims to contribute to the unity of Mathematics, from fundamentals to applications.

The purposes of ERCOM are:

- to constitute a forum for communications and exchange of information between the centres themselves and EMS
- to foster collaboration and coordination between the centres themselves and EMS
- to foster advanced research training on a European level
- to advise the Executive Committee of the EMS on matters relating to activities of the centres
- to contribute to the visibility of the EMS
- to cultivate contacts with similar research centres within and outside Europe

The current members of ERCOM are:

- **Abdus Salam International Centre for Theoretical Physics**, Trieste, Italy.
  www.ictp.trieste.it
- **Centre International de Rencontres Mathématiques**, Luminy, France.
  www.cirm.univ-mrs.fr
- **Centre de Recerca Matemàtica**, Barcelona, Spain.
  www.crm.es/
- **Centre for Mathematical Physics and Stochastics**, Aarhus, Denmark.
  www.maphysto.dk