

TIME TABLE

(Registration on Monday at 8:30)

TIME	Monday July 25	Tuesday July 26	Wednesday July 27	Thursday July 28	Friday July 29
9.00 - 9.45	Armbruster	Lefebvre	Ringhofer	Dashkovskiy	Armbruster
9.45 - 10.30	Armbruster	Lefebvre	Ringhofer	Dashkovskiy	Armbruster
11.00 - 11.45	Armbruster	Degond	Lefebvre	Wirth	Dashkovskiy
11.45 - 12.30	Armbruster	Degond	Lefebvre	Wirth	Dashkovskiy
14.30 - 15.15	Degond	Degond	Wirth	Wirth	
15.15 - 16.00	Degond	Degond	Wirth	Wirth	
16.30 - 17.15	Lefebvre	Ringhofer	Ringhofer	Dashkovskiy	
17.15 - 18.00	Lefebvre	Ringhofer	Ringhofer	Dashkovskiy	

ADMISSION AND ACCOMMODATION

Applicants must apply at least one month before the beginning of the course. Application forms should be sent on-line through our web site: <http://www.cism.it> or by post.

A message of confirmation will be sent to accepted participants. If you need assistance for registration please contact our secretariat.

The 700,00 Euro registration fee includes a complimentary bag, four fixed menu buffet lunches (Friday not included), hot beverages, on-line/downloadable lecture notes and wi-fi internet access.

A limited number of participants from universities and research centres who are not supported by their own institutions can be offered board and/or lodging in a reasonably priced hotel. Requests should be sent to CISM Secretariat by **May 25, 2011** along with the applicant's curriculum and a letter of recommendation by the head of the department or a supervisor confirming that the institute cannot provide funding. Preference will be given to applicants from countries that sponsor CISM.

The Deutscher Akademischer Austausch Dienst (DAAD) and the Deutsche Forschungsgemeinschaft (DFG) offer support to German students. Please contact:

DAAD, Kennedyallee 50, 53175 Bonn
tel. +49 (228) 882-0
e-mail: postmaster@daad.de
web site: <http://www.daad.de/de/kontakt.html>

DFG, Kennedyallee 40, 53175 Bonn
tel. +49 (228) 885 2655
e-mail: ing4@dfg.de
web site: <http://www.dfg.de>

Information about travel and accommodation is available on our web site, or can be mailed upon request.

For further information please contact:

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Centre International des Sciences Mécaniques
International Centre for Mechanical Sciences



ACADEMIC YEAR 2011
The Germain Session

MODELLING AND CONTROL OF MANUFACTURING AND LOGISTICS NETWORKS

Advanced School
coordinated by
Sergey Dashkovskiy
University of Bremen
Germany

Udine, July 25 - 29, 2011

MODELLING AND CONTROL OF MANUFACTURING AND LOGISTICS NETWORKS

The course aims to give a comprehensive introduction to the modern methods and tools in modeling, control and analysis of logistics systems and processes, such as those occurring in production and transport networks. Typical examples are: semiconductor wafer fabs, chemical batch plants, traffic of vehicles, supply chains, global logistics networks. Such networks appear very often as multi scale structures and can be modeled by means of interconnected dynamical systems. The interaction between their elements as well as perturbations that inevitably occur, lead to a complex nonlinear behavior that is

difficult to predict and to control. Complexity of such networks will be discussed and different approaches to handle them will be provided. The issues of performance, optimality, stability and robustness are important for planning and design of such systems. Moreover one would like to be able to predict what happens if a certain unexpected event occurs. With this in mind several engineering, mechanical, heuristic and mathematical methods will be given. In particular we will consider agent based approach, continuous, discontinuous and hybrid models, fluid models, gas dynamics methodology,

graph theory methods, systems and control methods, including model predictive control as well as methods of discrete event simulations. We will learn about the relation between micro and macro models for the same processes and the derivation from micro to macro analysis. Also an approach for model reduction will be considered. With help of these models such effects as pattern formations, self-organization, synchronization, emergence of order will be considered. Since robustness and stability are fundamental properties for vitality of logistics systems a special framework will be provided to study them. Stability

criteria taking into account the interactions between the elements of the network will be provided. These criteria can be applied to large networks with arbitrary interconnection structures. A special attention will be given to methodologies and their application in practice. To this end many realistic examples will be considered to illustrate the proposed methods and tools. This course will be of interest for PhD students and young postdoctoral researchers in civil and mechanical engineering, applied mathematics as well as industrial researchers interested in modeling, analysis and control of logistics systems and related processes.

PRELIMINARY SUGGESTED READINGS

J.L. Meriam and L.G. Kraige, Engineering Mechanics: Dynamics, SI 6th Edition, ISBN: 978-0-471-78703-7, John Wiley, 2008.

Papalambros and Wilde (2000): Principles of Optimal Design (2nd ed), Cambridge University Press, ISBN 0-521-62215-8.

P. Degond, S. Motsch, Continuum limit of self-driven particles with orientation interaction, Mathematical Models and Methods in Applied

Sciences, 18, Suppl. (2008), pp. 1193-1215.

D. Armbruster, P. Degond, C. Ringhofer, A model for the dynamics of large queuing networks and supply chains, SIAM J. Appl. Math. 66 (2006), pp. 896-920.

F. Berthelin, P. Degond, M. Delitala, M. Rasle, A model for the formation and evolution of traffic jams, Arch. Rat. Mech. Anal., 187 (2008), pp. 185-220.

S. Dashkovskiy, B.S. Rüffer, F.R. Wirth, An ISS Small Gain Theorem for General Networks, Mathematics of Control, Signals, and Systems, 19(2007)2, pp. 93-122.

B. Scholz-Reiter, F. Wirth, S. Dashkovskiy, M. Kosmykov, T. Makuschewitz, M. Schönlein, An approach to model reduction of logistic networks based on ranking, Proc. of the Second International Conference, LDIC 2009, Bremen, Germany, August 2009.

B. Scholz-Reiter, F. Wirth, S. Dashkovskiy, M. Kosmykov, T. Makuschewitz, M. Schönlein, Some remarks on stability and robustness of production networks based on fluid models, Proc. of the Second International Conference, LDIC 2009, Bremen, Germany, August 2009.

Y. Zou, I.G. Kevrekidis, D. Armbruster, Multiscale analysis of re-entrant production lines: An equation-free approach, Physica A, 363(1), 1-13, 2006.

INVITED LECTURERS

Dieter Armbruster - Arizona State University, AZ, USA
6 lectures on: Engineering and heuristic approaches for simulation of semiconductor production, discrete event simulations, fluid models, fully continuous models represented through partial differential equations. Model predictive control.

Sergey Dashkovskiy - University of Bremen, Germany
6 lectures on: Modeling of logistics networks by means of interconnected dynamical systems. Stability and robustness of logistics networks and systems, stability conditions, Lyapunov methods, design of stable logistics networks.

Pierre Degond - Université Paul Sabatier, Toulouse, France
6 lectures on: Analogies between systems of socially interacting agents and fluid mechanics. Relation between agent-based and macroscopic models. The role of the congestion constraint and the jamming transition in emergence phenomena.

Erjen Lefeber - Eindhoven University of Technology, The Netherlands
6 lectures on: A framework within which concepts from the systems and control field can be used for controlling manufacturing systems. Modeling and control of manufacturing systems. Model-based Predictive Control.

Christian Ringhofer - Arizona State University, AZ, USA
6 lectures on: Multiscale modeling, real time simulations and optimization of production flows. Mathematical foundation for a link between the local and fast timescales and the global long term timescales in complex production networks.

Fabian Wirth - University of Würzburg, Germany
6 lectures on: Stability of large scale logistic networks. Ranking in graphs and determination of network motifs. Subgraph approximation and robust approximation for large scale logistic networks. Model reduction for logistics networks.

LECTURES

All lectures will be given in English. Lecture notes can be downloaded from CISM web site, instructions will be sent to accepted participants.

**MODELLING AND CONTROL OF MANUFACTURING
AND LOGISTICS NETWORKS**

Udine, July 25 - 29, 2011

Application Form

(Please print or type)

Surname _____

Name _____

Affiliation _____

Address _____

E-mail _____

Phone _____ Fax _____

Method of payment upon receipt of confirmation (Please check the box)

The fee of Euro 700,00 includes IVA/VAT tax and excludes bank charges

I shall send a check of Euro _____

*Payment will be made to CISM - Bank Account N° 094570210900,
VENETO BANCA - Udine (CAB 12300 - ABI 05035 - SWIFT/BIC VEBHIT2M -
IBAN CODE IT46 N 05035 12300 09457 0210900).
Copy of the receipt should be sent to the secretariat*

*I shall pay at the registration counter with check, cash or VISA
Credit Card (Mastercard/Eurocard, Visa, CartaSi)*

**IMPORTANT: CISM is obliged to present an invoice for the above sum. Please
indicate to whom the invoice should be addressed.**

Name _____

Address _____

C.F.* _____

VAT/IVA* No. _____

(* Only for EU residents or foreigners with a permanent business activity in Italy.

Only for Italian Public Companies

I ask for IVA exemption (ex law n. 537/1993 - art. 14 comma 10).

Privacy policy: I understand that data received via this form will be used only to provide
information about CISM and its activities, within the limits set by the Italian legislative
decree no. 196/2003 and subsequent amendments.

Complete information on CISM's privacy policy is available at www.cism.it.

I have read the "Admission and Accommodation" terms and conditions and agree.

Date _____ Signature _____