TIME TABLE

TIME	Monday September 9	Tuesday September 10	Wednesday September 11	Thursday September 12	Friday September 13
9.00 - 9.45	Registration	Thome	Fabre	Thome	Workshop
9,45 - 10,30	Bertola	Azzopardi	Brauner	Soldati	Workshop
11,00 - 11,45	Azzopardi	Azzopardi	Brauner	Soldati	Workshop
11,45 - 12,30	Fabre	Bertola	Azzopardi	Brauner	Workshop
14,30 - 15,15	Azzopardi	Brauner	Bertola	Workshop	Workshop
15,15 - 16,00	Thome	Fabre	Thome	Workshop	Workshop
16,30 - 17,15	Thome	Fabre	Thome	Workshop	
17,15 - 18,00	Fabre	Bertola	Soldati	Workshop	

ADMISSION AND ACCOMMODATION

The registration fee amounts to 620,00 € or 430,00 € for participants on regular staff of Universities and Academies of Sciences.

Applicants should send their application form at the latest one month before the beginning of the course. Registration can be made by post, or on-line through our web site: http://www.cism.it.

A limited number of participants from Universities and Academies who are not supported by their own Institutions can be offered board and/or lodging at the University Residence (or a middle class hotel). **For this they should apply to the Secretariat of CISM by July 9, 2002** and enclose a curriculum and a letter of recommendation by the Dean confirming that the Institute has no funds for financing their participation. Preference will be given to applicants coming from countries which have adhered to CISM and contribute to its operating resources.

A list of hotels in Udine is available at http://www.cism.it or sent by post upon request. A limited number of single rooms are usually available at the University Residence at the price of approx. 18,00 € per person per night. Those interested should apply promptly through CISM.

Please, note that the Centre will be closed for summer vacations during the first three weeks of August.

For further information please contact:
CISM
Palazzo del Torso - Piazza Garibaldi 18
33100 Udine (Italy)
tel. +39 0432 248511 (6 lines)
fax +39 0432 248550
E-mail: cism@cism.it
http://www.cism.it

ACADEMIC YEAR 2002

The Lighthill Session

Modeling and Control of Two-Phase Flow Phenomena

Advanced School
Coordinated by

V. Bertola, Ecole Normale Supérieure Paris, France

Udine, September 9 - 13, 2002

International Centre for Mechanical Sciences
Centre International des Sciences Mécaniques

MODELING AND CONTROL OF TWO-PHASE FLOW PHENOMENA

Two-phase flow is one of the most common flows in nature as well as in industrial applications. It covers gas-solid, liquid-liquid, solid-liquid and gas-liquid flows. As an example, gas-liquid flow, which also includes the whole subject of boiling and condensation, is a topic of the utmost importance and exists in a wide range of industrial applications including evaporators, boilers, distillation towers, chemical reactors, condensers, oil pipelines, nuclear reactors, etc. In spite of the many efforts that have been made by the scientific community in terms of both economical and human resources, advancements in the knowledge of two-phase fluid dynamics have been relatively limited, so that very often two-phase phenomena cannot be adequately predicted or controlled.

This course deals with some recent advancements in two-phase flow modeling, with emphasis on gas-liquid and liquid-liquid systems. The topics of the lectures will cover the fundamentals of multiphase flows, closure problems applied to the mathematical modeling of the different flow patterns, pressure gradient and singular pressure drops in pipelines, boiling and condensation phenomena, experimental techniques for two-phase flow diagnostics. Emphasis will be given to topics which are subject of current research, such as liquid-liquid flows, flow visualization techniques, pressure drops across pipe fittings, turbulent dispersed flows.

The course will be complemented by a workshop, with the aim to provide a fertile environment for discussions, where participants to the course as well as academics and industry experts from both Engineering and Physics could present their recent results.

The course is addressed to PhD students and postdoctoral researchers in mechanical, nuclear and chemical engineering, applied mathematics and physics, who are interested in broadening their knowledge in the area of two-phase flow, and to senior scientists and engineers from relevant industries or institutions.

INVITED LECTURERS

B. AZZOPARDI - University of Nottingham, UK
5 lectures on:
Flow patterns; One dimensional models and empirical equations for frictional pressure drop; Flow pattern transitions; Pressure drop models based on flow patterns; Pressure drop across pipe fittings

V. BERTOLA - Ecole Normale Supérieure Paris, France
4 lectures on:
Two-Phase flow fundamentals; Void fraction measurements; Processing of experimental data; Flow visualization techniques.

N. BRAUNER - Tel Aviv University, Israel
4 lectures on:
Classification of liquid-liquid flows; Modeling of separated flows in liquid-liquid systems; Modeling of dispersed flows (water-in-oil or oil-in-water dispersions); Construction of flow pattern maps for liquid-liquid systems.

J. FABRE - Institut de Mecanique des Fluides Toulouse, France
5 lectures on:
Modeling of bubbly flow; Modeling of separated gas-liquid flow; Modeling of slug flow - I; Modeling of slug flow - II; Transient phenomena in two-phase flow.

A. SOLDATI - University of Udine, Italy
3 lectures on:
Lagrangian particle tracking in turbulent flows (DNS Fields); Particle dispersion in the boundary layer; Advection-diffusion models for turbulent wall-bounded flows.

J. R. THOME - Ecole Polytechnique Federale Lausanne, Switzerland
6 lectures on:
Principles of pool boiling; Flow boiling in vertical tubes; Flow boiling in horizontal tubes; Nusselt film condensation of vertical plates and horizontal tubes; Condensation on low finned tubes; Condensation inside tubes.

PRELIMINARY SUGGESTED READINGS

D. Chisholm, Two-Phase Flow in Pipelines and Heat Exchangers, George Godwin, London, (1983).

E. Dukler, J. Fabre, “Gas-Liquid Slug Flow Knots and Loose Ends”, Multiphase Science and Technology, Vol. 8, pp. 355-470 (1994).

N. Brauner, “Liquid-Liquid Two-Phase Flow”, Chap. 2.3.5 in HEDU - Heat Exchanger Design Update, edited by G.F. Hewitt 5 (1) (1998).

O.C. Jones, J.M. Delhaye, “Transient and Statistical Measurement Techniques for Two-Phase Flows: a Critical Review”, Int. J. of Multiphase Flow, vol. 3, pp. 89-116. (1975).

LECTURES

All lectures will be given in English. Lecture notes can be downloaded from CISM web site after registration.

MODELING AND CONTROL OF TWO-PHASE FLOW PHENOMENA

Udine, September 9 - 13, 2002

Registration Form

(Please print or type)

Surname _____

Name _____

Affiliation _____

Address _____

_____

E-mail _____

Phone _____ Fax _____

Method of Payment - (Please check boxes)

❑ I enclose a check of Euro 620,00 / 430,00 (IVA, VAT included and excluded bank charges)

❑ Payment has been made on CISM - Bank Account N° 210900, Banco di Sicilia - Udine (CAB 12300-ABI 01020-SWIFT BSICITRRUDN) Copy of the receipt should be sent to the secretariat

❑ I shall pay at the registration counter with a VISA Credit Card *(Mastercard/Eurocard, Visa, CartaSì)*

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.* _____

IVA or VAT* _____

(*) Only for EC or Italian residents or foreigners with permanent business activity in Italy.

According to the Italian law 675/96 in defense of privacy, your personal data will be used exclusively for conducting the course unless upon your explicit authorization.

Date _____ Signature _____

Please return to: CISM
Piazza Garibaldi, 18
33100 UDINE (Italy)