14th UIT Summer School

MICRO/NANO SCALE HEAT TRANSFER AND FLUID FLOW

Certosa di Pontignano, Vagliagli, 53010, Siena, Italy, Monday 8 September, 2014 – Saturday 13 September, 2014
Directors: Antonio Barletta; Gian Luca Morini

The broad area of fluid dynamics and heat transfer at very small scales is now a multi-disciplinary domain of differentiated and widespread techniques and applications involving both experimental research and theoretical tasks. The engineering community is now committed to face new and important problems where the classical paradigms, models and design tools for the analysis of heat transfer and fluid flow mechanisms are insufficient. The wide area of microfluidics with its manifold applications, e.g. in the MEMS design, is a typical example where effects absent or negligible at a large or intermediate scale become important or even dominant when the scale of the system is reduced. The intensification of heat transfer, required by the miniaturisation of devices, implies the use of novel techniques for the onset of convective and radiation processes. These facts motivated, especially in the last decade, the great improvement of the research about nanofluids and metal foams, with interesting challenges both from the prospect of applied physicists and that of engineers.
The 14th UIT Summer School is devoted to fill the gap in the education of MSc and PhD students between the classical heat transfer and fluid mechanics, and whatever emerged as new and peculiar when studying micro/nano scale systems. The lectures will cover the analysis of both single-phase and two-phase flows in mini/micro/nano channels and metal foams from a theoretical and experimental point of view, as well as the analysis of the most promising theoretical models and experimental techniques suggested for the investigation of transport phenomena in microdevices.
The lectures will be devoted to providing PhD and Post-Doc students with advanced and updated knowledge on the theoretical and experimental results made available in recent years. An open round table with poster session is scheduled within the School in order to offer to the students a space for highlighting their own views and research experience in this field.

Programme

	Monday 8 September	Tuesday 9 September	Wednesday 10 September	Thursday 11 September	Friday 12 September	Saturday 13 September
9.00		G. L. Morini *Single-Phase Convective Heat Transfer in Microchannels*	G. Croce *Numerical Simulation of Micro Heat Exchangers*	A. Barletta *Modelling Viscous Dissipation*	J. J. Brandner *Micro Heat Exchangers*	P. Asinari *Fundamentals of Lattice-Boltzmann Methods*
9.45		G. L. Morini *Single-Phase Convective Heat Transfer in Microchannels*	G. Croce *Numerical Simulation of Micro Heat Exchangers*	A. Barletta *Modelling Viscous Dissipation*	J. J. Brandner *Micro Heat Exchangers*	P. Asinari *Fundamentals of Lattice-Boltzmann Methods*
10.30		***Coffee break***	***Coffee break***	***Coffee break***	***Coffee break***	***Coffee break***
11.00		G. P. Celata *Multiphase Flows and Flow Boiling in Microchannels*	A. Frezzotti *Kinetic Theory for Gas Microflow Simulations*	L. Rossetto *Thermal Performances of Metal Foams*	A. Barletta *Thermal Instability in Porous Media*	D. A. S. Rees *Local Thermal Non-Equilibrium Effects in the Thermal Instability of Saturated Porous Media*
11.45		G. P. Celata *Multiphase Flows and Flow Boiling in Microchannels*	A. Frezzotti *Kinetic Theory for Gas Microflow Simulations*	L. Rossetto *Thermal Performances of Metal Foams*	A. Barletta *Thermal Instability in Porous Media*	D. A. S. Rees *Local Thermal Non-Equilibrium Effects in the Thermal Instability of Saturated Porous Media*
13.00	***Lunch***	***Lunch***	***Lunch***	***Lunch***	***Lunch***	***Lunch ****
14.30	G. P. Celata *Overview of Microscale Heat Transfer and Its Applications*	A. Barletta *Flow in Porous Media: an Introductory Survey*	Open round table & poster session	N. Bianco *Radiation Effects in Metal Foams*	S. Colin *Experimental Techniques in Microfluidics*	
15.15	G. P. Celata *Overview of Microscale Heat Transfer and Its Applications*	A. Barletta *Flow in Porous Media: an Introductory Survey*	Open round table & poster session	N. Bianco *Radiation Effects in Metal Foams*	S. Colin *Experimental Techniques in Microfluidics*	
16.00	***Coffee break***	***Coffee break***		***Coffee break***	***Coffee break***	
16.30	G. L. Morini *Scaling Effects and Micro-Effects in Microfluidics*	G. Croce *Numerical Analysis of Gas Flows in Microchannels*		Dominique Baillis *Heat Transfer in Micro and Nano Foams*	E. Nobile *Numerical Analysis of Convection in Metal Foams*	
17.15	G. L. Morini *Scaling Effects and Micro-Effects in Microfluidics*	G. Croce *Numerical Analysis of Gas Flows in Microchannels*		Dominique Baillis *Heat Transfer in Micro and Nano Foams*	E. Nobile *Numerical Analysis of Convection in Metal Foams*	
20.00	***Dinner***	***Dinner***	***Dinner***	***Dinner***	***Dinner***	

* For the lunch of Saturday 13th, each participant is kindly asked to confirm his/her presence at the *reception*.

Contributors

- Pietro Asinari – Politecnico di Torino – Torino –Italy
- Antonio Barletta – Alma Mater Studiorum Università di Bologna – Bologna – Italy
- Dominique Baillis – Institut National des Sciences Appliquées de Lyon – Lyon – France
- Nicola Bianco – Università degli Studi Federico II – Napoli – Italy
- Jürgen Brandner – Karlsruhe Institute of Technology – Karlsruhe – Germany
- Gian Piero Celata – ENEA – Roma – Italy.
- Stéphane Colin – Institut National des Sciences Appliquées de Toulouse – Toulouse – France
- Giulio Croce – Università degli Studi di Udine – Udine – Italy
- Aldo Frezzotti – Politecnico di Milano – Milano – Italy
- Gian Luca Morini – Alma Mater Studiorum Università di Bologna – Bologna – Italy
- Enrico Nobile – Università degli Studi di Trieste – Trieste – Italy.
- Andrew Rees – University of Bath – Bath – UK
- Luisa Rossetto – Università degli Studi di Padova – Padova – Italy.

Lecture Notes

Before the beginning of the Summer School the slideshows and/or notes of the lectures will be made available for download in a restricted access area of the UIT website (http://www.uitonline.eu).

Location

The 14th Summer School will be held at Certosa di Pontignano (Siena); further information can be gathered directly at Certosa website.

Application and fees

The registration fee is € 700,00 and includes application to the Summer School, coffee breaks, full board treatment from the diner of Monday 8th to the lunch of Saturday 13th. Each participant is kindly asked to confirm at the reception his/her presence at the lunch of Saturday 13th.
Lunch on Monday 18th will be helped at an additional € 20,17 fee to be paid on site.
For the application, please download and complete the form (in PDF or RTF format). Then, send it by E-mail, before September 3, 2014, to: certosadipontignano@rtmliving.com

For any further questions and requests, please contact:
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