Advanced Computational Methods and Experiments

in

Heat Transfer XI

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ADVANCED COMPUTATIONAL METHODS AND EXPERIMENTAL
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HEAT TRANSFER XI

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The Developments in Heat Transfer Book Series

WIT Transactions

Transactions Editor

Carlos Brebbia
Wessex Institute of Technology
Ashurst Lodge, Ashurst
Southampton SO40 7AA, UK
Email: carlos@wessex.ac.uk

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Editors

B. Sundén
Lund University, Sweden

C.A. Brebbia
Wessex Institute of Technology, UK

U. Mander
University of Tartu, Estonia

WIT PRESS Southampton, Boston

B. Sundén
Lund University, Sweden

C.A. Brebbia
Wessex Institute of Technology, UK

U. Mander
University of Tartu, Estonia

Published by

WIT Press
Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK
Tel: 44 (0) 238 029 3223; Fax: 44 (0) 238 029 2853
E-Mail: witpress@witpress.com
http://www.witpress.com

For USA, Canada and Mexico

Computational Mechanics Inc
25 Bridge Street, Billerica, MA 01821, USA
Tel: 978 667 5841; Fax: 978 667 7582
E-Mail: infousa@witpress.com
http://www.witpress.com

British Library Cataloguing-in-Publication Data

A Catalogue record for this book is available
from the British Library

ISBN: 978-1-84564-462-8
ISSN: 1746-4471 (print)
ISSN: 1743-3533 (online)

The texts of the papers in this volume were set individually by the authors or under their supervision. Only minor corrections to the text may have been carried out by the publisher.

Printed and bound in Great Britain by the MPG Book Group

Preface

Research and developments of computational methods for solving and understanding heat transfer problems continue to be important because heat transfer topics are commonly of a complex nature and different mechanisms like heat conduction, convection, turbulence, thermal radiation and phase change may occur simultaneously. Typically, applications are found in heat exchangers, gas turbine cooling, turbulent combustion and fires, fuel cells, micro- and minichannels, electronics cooling, melting and solidification etc. Heat transfer might be regarded as an established and mature scientific discipline, but it has played a major role in new emerging areas such as sustainable development and reduction of greenhouse gases as well as for micro- and nano-scale structures and bio-engineering. Non-linear phenomena other than momentum transfer may occur due to temperature-dependent thermophysical properties. In engineering design and development, reliable and accurate computational methods are requested to replace or complement expensive and time consuming experimental trial and error work. Tremendous advancements have been achieved during recent years due to improved numerical solutions of non-linear partial differential equations, turbulence modeling and computer developments to achieve efficient and rapid calculations. Nevertheless, further progress in computational methods will require developments in theoretical and predictive procedures – both basic and innovative – and in applied research. Accurate experimental investigations are needed to validate the numerical calculations.

Many relevant research topics were discussed during the Eleventh International Conference on Advanced Computational Methods and Experimental Measurements in Heat Transfer and Mass Transfer held in Tallinn, Estonia in 2010. The objective of this conference series is to provide a forum for presentation and discussion of innovative research, new approaches and application of advanced computational methods and experimental measurements to heat and mass transfer problems. This book contains the edited versions of most of the papers presented at the Conference.

The editors would like to thank all the distinguished and well-known

scientists who supported our efforts by serving on the International Scientific Advisory Committee, reviewing the submitted abstracts and papers. The excellent administrative work of the conference secretariat at WIT is greatly appreciated and the efficient co-operation and encouragement by the staff at WIT Press were essential in producing this book.

Bengt Sundén and Carlos Brebbia
Tallinn, 2010

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