Editors Preface

Engineering practice in general and mechanical design in particular are basically exercises of creativity, triggered by specific needs. As the engineed by specific needs. As the boundaries of known practices, design and manufacturing techniques into the frontiers of new materials and mechanical systems, energy sources and their effects upon the environment, the opportunities for failure will inevitably increase. If our knowledge of how to engineer systems, structures and components to minimize or prevent failure is to keep pace with modern demanding applications and the intolerance of a safety conscious society, we must develop and apply superior analytical and experimental tools to evaluate the potential for damage or failure of engineering structures and/or components and the associated energy harvesting systems.

Different tools are available to optimize any engineering solution, from which Experimental Mechanics has always played a most prominent role. It is related to such diverse disciplines as physical and mechanical sciences, engineering (mechanical, aeronautical, civil, automotive, nuclear, etc.), materials, electronics, medicine and biology, and uses experimental methodologies to test and evaluate the behaviour and performance of all kinds of materials, structures and mechanical systems. Quality control, safety, destructive and non-destructive testing of materials and components, analysis of prototypes and even fundamental research are some of the possible applications of Experimental Mechanics. During the last few decades the development of computer based techniques, as well as laser-optics methods, nanotechnologies and nanomaterials, among many other technological advances, added new dimensions and perspectives to Experimental Mechanics and Testing.

This CD-ROM contains the 566 papers accepted for presentation in the ICEM15-15th International Conference on Experimental Mechanics held in Porto/Portugal, 22-27 July 2012. The different papers are organized in three main parts: PART-A, with the files of the 11 Invited Plenary Papers, by distinguished academics and scientists in the field of Experimental Mechanics; PART-B, with 289 papers distributed by the 12 general tracks/main topics (from A to L); and PART-C, with the remaining 266 papers from the 20 Special Symposia in ICEM15.

The ICEM15 conference is part of a prestigious series of conferences that was initiated in 1959, in Delhi (India), then in Pit iers (France) in 1976, Delft (The Netherlands), and the last one took place in Poitiers (France) in July 2006. As in the Experimental Mechanics meetings resulted from the belief that of those disciplines associated with advanced product design and manufacture, experimental mechanics techniques have been making continuous and significant advances during the years. Important and dramatic improvements in the computational tools made by the compactness of the latest advances in experimental mechanics techniques applied to energy systems, structures and materials. Their effect on the environment is significant and will help in avoiding global warming and harmful CO₂ emissions.

It is organized by the Faculty of Engineering of the University of Porto (FEUP) and the Portuguese Association for Experimental Mechanics (APAET), under the auspices of the European Society for Experimental Mechanics (EURASEM), and sponsored by a number of national and international organizations, whose support is gratefully acknowledged: SEM-American Society for Experimental Mechanics, BSMM-British Society for Strain Measurement, JSME-Japanese Society of Mechanical Engineering, IMEKO-International Measurement Confederation, AFM-Association Française de Mécanique, DYMAT-European Association for Dynamics of Materials, INEGI-Instituto de Engenharia Mecânica e Gestão Industrial, LABIOMEP-Laboratório de Biomecânica do Porto, LNEC-Laboratório Nacional de Engenharia Civil, FCT-Fundação para a Ciência e a Tecnologia, FCT-Fundação Calouste Gulbenkian, FLAD-Fundação Luso-Americana para o Desenvolvimento, CCDRN-Comissão de Coordenação e Desenvolvimento Regional do Norte, ABEU-PCO, Professional Congress Organizer, and Teatro Nacional S. João/Secretaria de Estado da Cultura.

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