

IRF2018

INTEGRITY–RELIABILITY–FAILURE

**IN AUTOMOTIVE, LOCOMOTIVE, AEROSPACE, CIVIL
ENGINEERING AND BIOMECHANICS**

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Editors

J.F. Silva Gomes and Shaker A. Meguid

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PREFACE

IRF2018 is the sixth international gathering of a prestigious series of Integrity-Reliability-Failure conferences coordinated by the International Scientific Committee of Mechanics and Materials in Design. This series of conferences are wholly devoted to advances in mechanics, materials, structural integrity and design. IRF2018 is jointly sponsored by the University of Porto, the University of Toronto and the Portuguese Society for Experimental Mechanics. The conference attracted over 200 participants with 258 accepted submissions involving 702 authors from 42 different countries around the world. The conference themes which address novel and advanced topics on Integrity, Reliability and Failure focused on Automotive, Locomotive, Aerospace, Civil Engineering and Biomechanics, including Computational Mechanics, Experimental Mechanics, Fracture and Fatigue, Composite and Advanced Materials, Tribology and Surface Engineering, Mechanical Design and Prototyping, Biomechanical Applications, Civil Engineering Applications, Energy and Thermo-Fluid Systems, and Industrial Engineering and Management, among other topics.

The conference also included an Open Forum on “*Can Professors Balance Scholarly Work, Teaching and Admin? The Challenges Going Forward*”, where an expert panel with many years of collective and active researchers and educators addressed the issue of balancing the activities of teaching, research and services within the universities.

We believe that the meeting offered our delegates a forum for the discussion and dissemination of their recent work in assessing the integrity, reliability and failure of engineering structures, components and systems, fostered research that integrates mechanics and materials in the design process, and promoted exchange of ideas and international co-operation among scientists and engineers in this important field of engineering.

We are particularly indebted to the authors and special guests for their presentations. Each of the 258 contributions offered opportunities for thorough discussions with the authors. Particularly, we acknowledge the excellent contributions of the participants, their innovative ideas and research directions, the novel modeling and simulation techniques, and the invaluable critical comments. We are also indebted to the outstanding keynote speakers who highlighted the conference themes with their contributions and covered the main topics of the conference. We also take this opportunity to thank the members of the International Scientific Committee and the reviewers for their time and helpful suggestions, the symposia organisers for their efforts and valuable contributions to the success of the event, and the local organising committee for an absolutely superb organization of the meeting in this magnificent city. To all of you, we offer our gratitude.

Given the rapidity with which science is advancing in all areas of mechanics and materials, the next conference in this series (Mechanics and Materials in Design - M2D2019) will take place in the beautiful city of Funchal/Madeira, in July 2019. Undoubtedly, we expect M2D2019 to be as stimulating and interesting as IRF2018, as evidenced by the excellent contributions offered in this current event. We look forward to seeing all of you in Madeira next year.

Shaker A. Meguid and J.F. Silva Gomes
Lisbon / Portugal, July 2018

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MADL-Mechanics and Aerospace Design Lab, University of Toronto
APAET-Portuguese Society for Experimental Mechanics
EURASEM-European Society for Experimental Mechanics
SEM-American Society for Experimental Mechanics
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 Ciência e Inovação em Eng^a. Mecânica e Eng^a. Industrial
LABIOMEPE-Laboratório de Biomecânica do Porto
FCT-Fundação para a Ciência e a Tecnologia
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- A. COMPOSITE AND ADVANCED MATERIALS. (Pages: 11-48)
- B. COMPUTATIONAL MECHANICS. (Pages: 48-76)
- C. EXPERIMENTAL MECHANICS AND INSTRUMENTATION. (Pages: 77-106)
- D. FATIGUE AND FRACTURE MECHANICS. (Pages: 107-134)
- E. NANOTECHNOLOGIES AND NANOMATERIALS. (Pages: 135-152)
- F. TRIBOLOGY AND SURFACE ENGINEERING. (Pages: 153-164)
- G. MECHANICAL DESIGN AND PROTOTYPING. (Pages: 165-180)
- H. BIOMECHANICAL APPLICATIONS. (Pages: 181-206)
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- L. INDUSTRIAL ENGINEERING AND MANAGEMENT. (Pages: 307-330)

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1. EXPERIMENTAL MECHANICS FOR RELIABILITY, promoted by J.F. Silva Gomes (U.Porto, Portugal). (Pages: 333-344)
2. MODELING OF FRACTURE AND FRAGMENTATION OF SOLIDS UNDER STATIC AND DYNAMIC LOADING. DETERMINISTIC AND PROBABILISTIC APPROACHES, promoted by Alexander Gerasimov (Tomsk State University, Russia) and Sergey Zelepugin (Tomsk State University, Russia). (Pages: 345-370)
3. FRACTURE BEHAVIOUR AND FATIGUE DAMAGE OF STRUCTURES: THEORY AND EXPERIMENTS, promoted by Shaker A. Meguid (U. Toronto, Canada). (Pages: 371-382)
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