ECCOMAS Thematic Conference

4th International Conference on

Numerical and Symbolic Computation

Developments and Applications

PROGRAM and ABSTRACTS

April, 11 - 12,

ISEP – Instituto Superior de Engenharia do Porto

PORTO, Portugal

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APMTAC

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SYMCOMP 2019 – 4th International Conference on Numerical and Symbolic Computation: Developments and Applications

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Edited by APMTAC – Associação Portuguesa de Mecânica Teórica, Aplicada e Computacional

Editors: Maria Amélia Loja (IDMEC, ISEL/CIMOSM), Joaquim Infante Barbosa (IDMEC, ISEL/CIMOSM), José Alberto Rodrigues (ISEL/CIMOSM) e Paulo B. Vasconcelos (CMUP/FEP-UP)

April, 2019

1 – Introduction

The Organizing Committee of SYMCOMP2019 – 4th International Conference on Numerical and Symbolic Computation: Developments and Applications, welcomes all the participants and acknowledge the contribution of the authors to the success of this event.

This fourth International Conference on Numerical and Symbolic Computation, is promoted by APMTAC - Associação Portuguesa de Mecânica Teórica, Aplicada e Computacional and it was organized in the context of IDMEC - Instituto de Engenharia Mecânica, Instituto Superior Técnico, Universidade de Lisboa. With this ECCOMAS Thematic Conference it is intended to bring together academic and scientific communities that are involved with Numerical and Symbolic Computation in the most various scientific areas

SYMCOMP 2019 elects as main goals:

To establish the state of the art and point out innovative applications and guidelines on the use of Numerical and Symbolic Computation in the numerous fields of Knowledge, such as Engineering, Physics, Mathematics, Economy and Management, Architecture, ...

To promote the exchange of experiences and ideas and the dissemination of works developed within the wide scope of Numerical and Symbolic Computation.

To encourage the participation of young researchers in scientific conferences.

To facilitate the meeting of APMTAC members (Portuguese Society for Theoretical, Applied and Computational Mechanics) and other scientific organizations members dedicated to computation, and to encourage new memberships.

We invite all participants to keep a proactive attitude and dialoguing, exchanging and promoting ideas, discussing research topics presented and looking for new ways and possible partnerships to work to develop in the future.

The Executive Committee of SYMCOMP2019 wishes to express his gratitude for the cooperation of all colleagues involved in various committees, the Scientific Committee, the Programm Committee, Organizing Committee and the Secretariat. We hope everyone has enjoyed helping to consolidate this project, which we are sure will continue in the future. Our thanks to you all.

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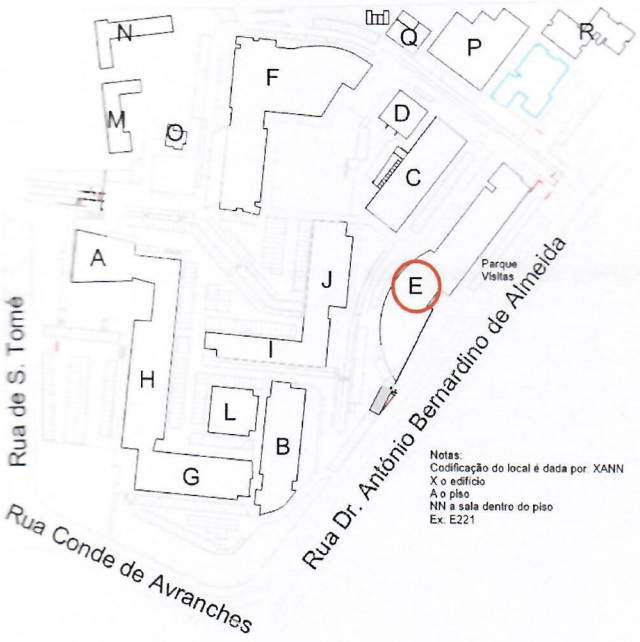
PLACE OF THE EVENT

ISEP – Instituto Superior de Engenharia do Porto

Rua Dr. António Bernardino de Almeida, 431, Porto

(Building E)



FRIDAY, APRIL, 12, 2019

LOCAL: SALA DE REUNIÕES - ISEP

SESSION IX, Computational Structural and Thermal Safety Engineering 09:45 – 11:00 CHAIR: *Prof. Paulo Piloto and Prof. Elza Fonseca*		
ID	COMMUNICATION TITLE	AUTHORS
A04	Numerical simulations of industrial seel portal frames under fire conditions	Nourredine Benlakehal, Abdelkader Bougara, A. Fellouh and Paulo A. G. Piloto
A13	Fire safety of wood-steel connections	Elza M. M. Fonseca, Lino Silva and Pedro A. S. Leite
A14	Critical temperature for the components of composite slabs with steel deck under fire for load-bearing rating	Paulo A. G. Piloto, C. Balsa, F.F. Ribeiro, L. Santos, R. Rigobello and Érica Kimura
A03	Fire performance of partially encased column subjected to eccentric loading	Abdelkadir Fellouh, A. Bougara, Paulo Piloto and Nourredine Benlakehal
A43	Models and numerical methods for marine vehicles trajectory optimization	Miguel Aguiar, Jorge Estrela Silva and João Borges Sousa

SESSION XI: Numerical and Symbolic Computation in Mathematics, Finance and Economics, 11:15–12:30 CHAIR: *Prof.* Óscar Afonso *and Prof. Jorge Andraz*		
ID	COMMUNICATION TITLE	AUTHORS
A29	Dynamic effects of International trade under imperfect competition and economies of scale	Óscar Afonso and Paulo B. Vasconcelos
A20	Estimating the 'Employment Band of Inaction' with Multiple Breaks Due to Labour Market Reforms	Paulo Mota and Paulo B. Vasconcelos
A32	Dynamic and interactive mathematical tools in socio-economic sciences classrooms	Jorge M. Andraz and Ana C. Conceição
A34	An interactive way of analyzing economic concepts using symbolic computation	J. M. Andraz, R. Candeias, Ana C. Conceição and Inês Serafim
A37	Factor distribution meets Industrial Organization: the labor share's behavior under a neo-Schumpeterian environment	Ana Oliveira

SYMCOMP 2019
Porto, 11-12 April 2019

S10 – CRITICAL TEMPERATURE FOR THE COMPONENTS OF COMPOSITE SLABS WITH STEEL DECK UNDER FIRE FOR LOAD-BEARING RATING

Paulo A. G. Piloto[1]*, Carlos Balsa[1], Fernando Ribeiro[2], Lucas Santos[3], Ronaldo Rigobello[2] and Érica Kimura[3]

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Keywords: Composite slabs with profiled steel deck, Fire, Critical temperature, Numerical validation.

Abstract *Composite slabs made with concrete and steel deck are widely used in building structures. They also include other components, such as steel rebars for positive bending and a steel mesh for negative bending, preventing cracks in concrete. The fire rating of this type of elements can be determined by standard fire tests, accounting for load (R), Integrity (E) and Insulation (I). This investigation deals with the fire resistance for load (R) and insulation (I), using a numerical model validated with experimental tests. This model considers material and geometric non-linear behaviour, using perfect contact between materials. The 3D finite element mesh uses solids, shells and bars, to model a simply supported composite slab with 3.2m long, 0.65 m wide and total height of 143mm, using a trapezoidal steel deck PRINS PSV73. Different load levels are simulated (live load ranging from 1.0 kN/m² to 21 kN/m²) in addition to the dead load (2.8 kN/m²). The fire resistance (R) is determined according to standards, looking for the maximum displacement or the rate of displacement, while the fire resistance (I) looks for the average or for the maximum temperature increase at the unexposed side. The critical temperature of each steel component decreases with the load level. A new proposal is presented for the fire resistance depending on the load level.*