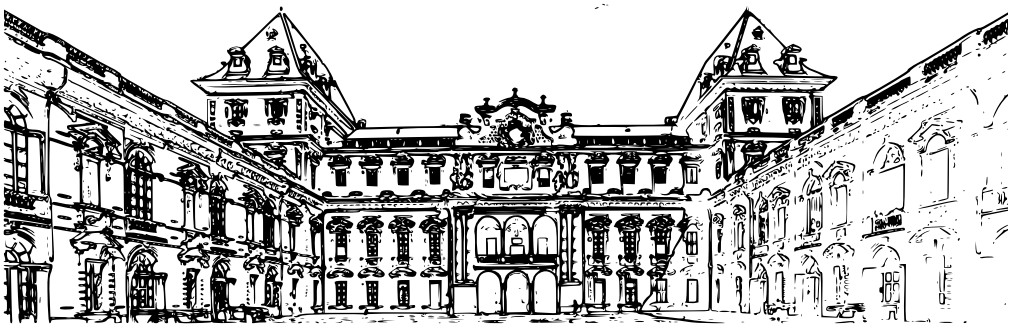

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Tuesday Afternoon / 19 June / Aula 1V

Session 7 — Integrated Computational Materials Engineering (ICME) for advanced structures-II

Chaired by Marianna Maiarù (U Mass Lowell), Evan J. Pineda (NASA)

1400	1425	1450	1515	1540
Variability of mechanical properties of viscoelastic sandwich structures determined by an inverse identification method K.S. Ledi, M. Hamdaoui, G. Robin, E.M. Daya	An approach for modelling the damping of flax-epoxy laminated composite L. Duigou, S. Mahmoudi, J.M. Cadou, E.M. Daya, G. Robin	A component-wise formulation for virtual testing of composites I. Kaleel, A.G. de Miguel, M.H. Nagaraj, A. Pagani, M. Petrolo, E. Carrera	Material charcterization and modeling of graphene nanoplatelets reinforced composited for ICME studies M. Maiarù, M. Salviato, Y. Qiao, S. Shah	Modeling-Driven Design of Spacecraft Hardware with Improved Shear Toughening Using Graphene Nanoplatelet/Carbon Fiber/Epoxy Hybrid Composites J. Tomasi, W. Pisani, S. Chinkanjanarot, A.S. Krieg, E. Pineda, B. Bednarcyk, S. Miller, J. King, I. Miskioglu, G. Odegard

Tuesday Afternoon / 19 June / Sala Zodiaco

Session 13 — Damage and failure

Chaired by Bruno Castanié (U Toulouse), Alberto Milazzo (U Palermo)

1400	1425	1450	1515	1540
Continuum damage modeling of shear postbuckling in honeycomb core J. De Dios Rodriguez, B. Castanie, C. Bouvet	Computational homogenisation and microcracking analysis of piezoelectric ceramics I. Benedetti, V. Gulizzi, A. Milazzo	A reduced model for handling the instabilities of long fiber reinforced composite with multilevel finite element method R. Xu, Y. Hui, Q. Huang, H. Hu, H. Zahrouni, T. Ben Zineb, S. Zhu	Multiple cracks localization for thin coating film layers in pure bending G. Borino, F. Parrinello	A study of interfacial property of composite based on energy-based debonding criterion P.Y. Pei, Y. Shi, H. Qing, C.F. Gao

Tuesday Afternoon / 19 June / Sala Caccia

Session 10 — Classical and non-classical continuum theories and constitutive theories for solid continua-II

Chaired by J.N. Reddy (Texas A&M), Karan S. Surana (U Kansas)

1400	1425	1450	1515	1540
Strain-rate modelling of composite materials by a fractional derivative approach A. Krasnobrizha, O. Polit, E. Valot	Finite element model updating for identification of constitutive parameters in strain gradient theory I. Jeong, E. Kim, M. Cho	A variational approach to brittle fracture and interface decohesion in composites: theory and applications M. Paggi, J. Reinoso, V. Carollo	Internal resonances in dynamics of nonlinear plates M.V. Shitikova, E.I. Osipova	The rigid-body plastic analysis of free-end torsion problem using a newly developed constitutive equation based on the plastic spin concept H. Mehdipour, G. Belingardi

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MULTIPLE CRACKS LOCALIZATION FOR THIN COATING FILM LAYERS IN PURE BENDING

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Recently, accurate small scale four-point bending flexural tests, for superalloy specimens with multiple ceramic type external coating film layers, have shown that under high loading, the failure mechanism is characterized by the development of complex multiple surface cracks, followed by interior interlayers debonding mechanisms. The final stage is then the complete debonding of the fragmented thermal coating, which leave the interior superalloy completely uncoated. The mechanical problem has an high technological relevance, since failure, or just severe damage, of the ceramic coating, can jeopardize the functionality of structural elements working at high temperature and under severe loadings, such as blades of gas turbines of aircraft engines or high performance electricity generators.
This paper presents a nonlinear finite element analysis of the thermomechanical problem modelled as a 2D structure subjected to pure bending. The structural element is composed by an elastic substrate with several thin layers of quasibrittle coating materials, disposed as films in the tensile side of the element. The layers are modelled by an elastic damage constitutive relation and, in order to describe the interlayer decohesion effects, along the layer boundaries and between the first coating layer and the elastic substrate, zero-thickness cohesive-frictional interface elements are disposed.
The presented nonlinear finite element analysis results show the evolution of the fracture patterns and the different possibilities of cracks distribution. It is also analyzed the effects of the thickness of the coating films and the qualitative and quantitative response as function of the fracture energy of the interface compared to the fracture energy in mode I of the coating film. Finally a critical review of the nonlinear response and a general comment on the most efficient strategy for improving the mechanical resistance to failure will be discussed.