ALL. B

SCHEDA PER LA RELAZIONE ANNUALE DEL DOTTORANDO CICLO Anno

- Nome e Cognome Ibrahim Kaleel
- Dottorato in **INGEGNERIA MECCANICA**
- Ciclo XXXI Anno di Corso 2016/2017
- Dipartimento di afferenza DIMEAS
- Coordinatore **Prof. Luigi GARIBALDI**
- Tutore Prof. Erasmo Carrera
- Area Culturale di Interesse (in Italiano e Inglese)
  Development of an efficient finite element framework for failure analyses of metallic and composite structures via the Carrera Unified Formulation
- Breve descrizione dell'argomento della tesi o dell'Area Culturale di Interesse (massimo 20 righe, in Italiano e Inglese)
  The research work deals with exploiting numerically efficient one-dimensional structural models based on Carrera Unified Formulation for five classes of problems: (1) Structural analysis with material non-linearity and (2) Progressive failure analysis in composites (3) linear and non-linear micromechanical analysis of composites using CUF (4) High-fidelity composite analysis via multi-scale modeling and (5) Impact analysis in composite structures using node-dependent kinematics (NDK). Plastic constitutive law is based on von-Mises J_2 flow theory and continuum damage mechanics based smeared crack band model is implemented in the CUF framework. In order to solve the non-linear system of equations, two classes of solvers are implemented (1) Load/Displacement-based Newton-Raphson scheme and (3) Energy-based path following iterative solver. Additionally, python-script are developed for interfacing CUF with commercial codes such as ABAQUS.

- Attività di formazione svolta nell'anno (corsi, seminari, etc.); per ogni attività specificare natura, durata e sede

1. Self Management: techniques for work environment (Soft) 8h PoliTO
2. Spring School – Computational methods of the analysis design, and failure of composites Hard 21h CISM (Udine)
3. Composites Simulation Workshop (Hard) 20h Purdue University (USA)
4. Workshop on Composite Manufacturing and Process Simulation (Hard) University of Bristol(UK) 18h

- Eventuale partecipazione del Dottorando ad ulteriori attività di ricerca nell'anno (progetti e convenzioni di ricerca)
  1. 'Progetto Internazionalizzazione DIMEAS/Purdue'. International cooperation between the of the Department of Mechanical and Aerospace Engineering of Politecnico di Torino and Purdue University. 10/10/2016 – 31/10/2016. West Lafayette, IN, USA.

- Eventuale partecipazione del Dottorando ad Attività interne di supporto alla didattica nell'anno (specificare su quali corsi, e se eventualmente il Dottorando sia stato nominato Cultore della Materia)

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- Eventuali soggiorni presso altri Centri di Ricerca nell'anno
  1. FULLCOMP project secondment: Research stay with Prof. Anothony Waas at William E. Boeing Department of Aeronautics and Astronautics, University of Washington, USA. Duration: 01/11/2016-28/02/2017

- Eventuali collaborazioni con imprese nell'anno

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- Elenco delle Pubblicazioni del Dottorando

Journals:

1. I. Kaleel, M. Petrolo, A. M.Waas, E. Carrera. Computationally efficient, high-fidelity micromechanics framework using refined 1D models. *Composite Structures*. (2017) 181:358-367 https://doi.org/10.1016/j.compstruct.2017.08.040
2. E. Carrera, I. Kaleel,M. Petrolo. Elastoplastic analysis of compact and thin walled structures using classical and refined beam finite element models. *Mechanics of Advanced Materials and Structures*. (In press), 2017. http://dx.doi.org/10.1080/15376494.2017.1378780
3. I. Kaleel, M. Petrolo, A. M. Waas, E. Carrera. Micromechanical Progressive Failure Analysis of Fiber-Reinforced Composite using Refined Beam Models. (Submitted), 2017
4. M. Petrolo, I. Kaleel, G. De Pietro, E. Carrera. Wave propagation in compact, thin-walled, and layered beams using refined finite element models. (Submitted), 2016

Conference proceedings:

1. M. Petrolo, E. Carrera, I. Kaleel. "Efficient Component-Wise Finite Elements for the Dynamic Response Analysis of Metallic and Composite Structures", 1st International Conference on Impact Loading of Structures and Materials (ICILSM 2016), 23 May 2016, Torino, Italy.
2. E. Carrera, I. Kaleel, M. Petrolo. "Progressive Damage Analysis of Composite Structures via One-Dimensional Carrera Unified Formulation", XIX International Conference on Composite Structures, ICCS19, 5-9 September 2016, Porto, Portugal
3. I. Kaleel, M. Maiaru, M. Petrolo, E. Carrera, A.M. Waas. "Fast two-scale computational model for progressive damage analysis of fiber reinforced composites". 25th Annual International Conference on Composite/Nano Engineering, ICCE-25, 16-22 July 2017, Rome, Italy.
4. I. Kaleel, M. Petrolo, E. Carrera, A.M. Waas. " Efficient high-fidelity two-scale computational model for progressive failure analysis of fiber reinforced composites via refined beam models", 6th ECCOMAS Thematic Conference on the Mechanical Response of Composites COMPOSITES 2017, 20-22 September 2017, Eindhoven, Netherlands.
5. I. Kaleel, M. Petrolo, E. Carrera, A.M. Waas. “Micromechanical progressive failure analysis of fiber-reinforced composite using refined beam models“ International Mechanical Engineering Congress & Exposition, IMECE2017, 3-9 November 2016, Florida, USA.
6. E. Carrera, A. Pagani, M. Petrolo, A. G. De Miguel, I. Kaleel. “Component-Wise Method for Macro-Meso-Micro Modeling and Failure Analysis of Composite Structures“. American Society for Composites (ASC) 32nd Annual Technical Conference, 23-25 October 2017, West Lafayette, Indiana
7. I. Kaleel, E. Carrera , M. Petrolo. “Numerical simulation of delamination in laminated structures”. International Conference on Composite Materials and Structures. 27-29th December 2017, Hyderabad, India.

Torino,

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Firma del Tutore

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Firma del Dottorando

Il Coordinatore

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