Jack Chessa

ASSOCIATE PROFESSOR
MECHANICAL ENGINEERING
THE UNIVERSITY OF TEXAS AT EL PASO
500 WEST UNIVERSITY AVE   EL PASO, TEXAS 79968-0521   jfchessa@utep.edu
TEL (915) 747-6900   **FAX** (915) 747-5019

Profile

Professor Chessa's research interests are in the area of computational solid mechanics (CSM) and computational fluid dynamics (CFD). Primarily, he is interested in the development and implementation of advanced numerical methods towards mechanics problems that are seen as difficult in the context of the currently available methods. The majority of his work has been in the area of finite element methods and the development of extended finite element methods (X-FEM). He has developed methods that model multiphase flows, fluid structure interaction and solidification problems without remeshing while retaining high fidelity at the moving interfaces. Also, he is interested in the use of enriched and multiscale methods as well as coupling these methods to molecular dynamics models to aid in the design of advanced materials such as ultrahigh temperature ceramic composites, nano-phase composites and nanostructures.

Education

Northwestern University, Evanston, Illinois — PhD Mechanical Engineering, 2003
Dissertation: *"The extended finite element method for two-phase and free surface flows"*
Advisor: Ted Belytschko

Rensselaer Polytechnic Institute, Troy, New York — MS Theoretical and Applied Mechanics, 1998

Union College, Schenectady, New York — BS Mechanical Engineering, 1991

Experience

Associate Professor, *Mechanical Engineering*, The University of Texas at El Paso 2007-Present
Assistant Professor, *Mechanical Engineering*, The University of Texas at El Paso 2003-2007
Graduate Research *Assistant, Mechanical Engineering*, Northwestern University 1998-2003
Structural Analyst, *Silicon Valley Group*, Wilton, CT 1996-1998
Engineering Consultant, *Human Factors Industrial Design Inc.*, New York, New York 1995-1996
Project Engineer, *KIrby Lester Inc*., Stamford, CT 1993-1995
Research Assistant, *Watervliet Arsenal, Watervliet*, New York 1990-1991

Classes

- Advanced Mechanics of Materials I - Graduate level introduction to solid mechanics.
- Advanced Mechanics of Materials II - Advanced topics in solid mechanics. s
- Engineering Analysis - Undergraduate numerical methods class.
- Advanced Finite Element Analysis - Graduate level nonlinear finite element method.
- Theory of Finite Element Analysis - Graduate level finite element method.
- Introduction to CAD/CAM - Senior level class theory and application of CAD/CAM/CAE.
- Advanced Dynamics - Graduate level class in analytical dynamics.

Professional Awards/Affilations/Serivce

- Reviewer for the International Journal of Numerical Methods in Engineering
- Reviewer for the Computer Methods in Applied Mechanics and Engineering
- Reviewer for the ASME Journal of Fluids Engineering
- Reviewer for the IEEE International Parallel and Distributed Processing
- Grant proposal reviewer for the ARO/ARL
- ASME and SAE student chapter adviser
- Walter P. Murphy Graduate Fellowship, 1998-2000
- NSF IGERT Graduate Trainee 2001-2002
- Deans List, Union College, 1988-1991
- Member of Tau Beta Pi, engineering honors society
- Member of Pi Tau Sigma, engineering honors society

Peer-Reviewed Journal Publications

H. Wang, J. Chessa, WK Liu, and T Belytschko, *The immersed/fictitious element method for fluid-structure interaction: Volumetric consistency, compressibility and thin members,* INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 74 (1):32-55 2008, Times Cited **0**

A Bronson and J Chessa, *An evaluation of vaporizing rates of SiO2 and TiO2 as protective coatings for ultrahigh temperature ceramic composites*, JOURNAL OF THE AMERICAN CERAMIC SOCIETY 91 (5):1448-1452 2008, Workshop on Ultra-High-Temperature Ceramic Materials, JUL 23-25, 2007, Menlo Pk, CA, Times Cited **1**

J Chessa, and T Belytschko, *A local space-time discontinuous finite element method*, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 195 (13-16):1325-1343 2006, Times Cited **11**

R Muhanna, V Kreinovich, P Šolín, and J Chessa, *Interval finite element methods: New directions*, Proceedings of the Second International Workshop on Reliable Engineering Computing, 2006 Times Cited **3**

A Choudhuri, J Camacho, and J Chessa, *Flame synthesis of coiled carbon nanotubes*, FULLERENES NANOTUBES AND CARBON NANOSTRUCTURES 14 (1):93-100 2006, Times Cited **5**

A Legay, J Chessa, and T Belytschko, *An Eulerian-Lagrangian method for fluid-structure interaction based on level sets*, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 195 (17-18):2070-2087 2006, Times Cited **10**

J Chessa and T Belytschko, *Arbitrary discontinuities in space-time finite elements by level sets and X-FEM*, INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 61 (15):2595-2614 2004, Times Cited **22**

J Chessa, HW Wang and T Belytschko, *On the construction of blending elements for local partition of unity enriched finite elements,* INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 57 (7):1015-1038 2003, Times Cited **57**

J Chessa and T Belytschko, *An enriched finite element method and level sets for axisymmetric two-phase flow with surface tension*, INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 58 (13):2041-2064 2003, Times Cited **27**

FL Stazi, E Budyn, J Chessa and T Belytschko, *An extended finite element method with higher-order elements for curved cracks*, COMPUTATIONAL MECHANICS 31 (1-2):38-48 2003, Times Cited **36**

Chessa, J, and T Belytschko, *An extended finite element method for two-phase fluids*, JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME 70 (1):10-17 2003, Times Cited **15**

J Chessa, P Smolinski, and T Belytschko, *The extended finite element method (XFEM) for solidification problems*, INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 53 (8):1959-1977 2002, Times Cited **36**

Conference Presentations and Papers

D. Masillamani and J. Chessa, Determination of optimal cutting conditions in orthogonal metal cutting using LS-DYNA with design of experiments approach. Proceedings of the Eight Internaional LS-DYNA Users Conference, Dearborn, MI, May 2004.

J. Chessa, C. Arias, M. Huerta and M. Beard A Verified and Validated Study of Quasi-Static Bolted Lap Joints. Proceedings of the XXIV International Society of Experimental Mechanics IMAC, St. Louis, MO, January 2006.

J. Chessa. Enriched finite element method for two-phase axisymmetric flow. Eighth U.S. National Conference of Computational Mechanics, Austin, Texas, August 2005.

J. Chessa. Enriched finite element method for two-phase axisymmetric flow. Seventh U.S. National Conference of Computational Mechanics, Albuquerque, New Mexico, August 2003.

J. Chessa, H. Wang and T. Belytschko. On the construction of blending elements in enriched finite element methods. Seventh U.S. National Congress of Computational Mechanics, Albuquerque, New Mexico, August 2003.

J. Chessa and T. Belytschko. Extended finite element and level set methods for free-surface and phase interface problems. Sixth U.S. National Congress of Computational Mechanics, Dearborn, Michigan, August 2001.

P. Smolinski and J. Chessa. The enhanced finite element solution for Stefan problems. Sixth U.S. National Congress of Computational Mechanics, Dearborn, Michigan, August 2001.

T. Belytschko, N. Mo¨es, A. Gravouil and J. Chessa. Evolving strong and weak discontinuities and level sets in finite elements. Mechanics and Materials Conference, San Diego, California June 2001.

T. Belytschko, J. Xu, H. Chen, and J. Chessa. Meshfree methods and level sets. ICTAM, Chicago, Illinois, August 2000.

T. Belytschko and J. Chessa. Meshfree EFG and level Sets for moving surface problems. Finite elements in flow problems 2000, Austin, Texas 2000.

Funded Research and Grants

A Computational and Experimental Investigation into Dynamic Fracture of ZrO2Y2O3 Coatings for ZrBr2/ZrC composite containing Y2Ti2O7 precipitates at 1750C. Amount $99,983, Agency: ARFL, Duration 01/2009-01/2011, Status Current

Computational Design of ZrO2-Y2O3-TiO2-Ta2O5 Scales Containing Y2Ti2O7 Precipitation for Oxidation Resistance of ZrB2/ZrC Composites at 1700°C. Amount $349,972, Agency: AFOSR, Duration 04/2009-04/2012, Status Current

"A Validation and Verification Study of Bolted Joints", Principal Investigator, Sandia National Laboratories, 2004 - 2005, Awarded $35,000.

"Post calibration extension of validated and verified models", Principal Investigator, Sandia National Laboratories, 2005 - 2006, Awarded $40,000.

"Enriched Finite Elements for the Modeling of Adiabatic Shear Bands" ARL, Principal Investigator, 2004 - 2005, Awarded $25,000.

Sun Server Grant, Principal Investigator, General Motors Corporation, 2004 -2005, Awarded $9,000 in kind. "Design of extra-ciricular activities for the Development of PACE Program Ob jectives", Principal Investigator, General Motors Corporation, 2004 -2005, Awarded $7,000.

"Validation of aircraft structures", Principal Investigator, CSC Computer Science Corporation, 2004 -2005, Awarded $125,000.

"Computational Design of ZrO2-SiO2 Coatings on ZrB2/ZrC/ZrO2 composites Containing ZrSi Intermetallics for Oxidizing Atmospheres at 1700C", Co-Principal Investigator with Principal Investigator Arturo Bronson, AFOSR, 2005 - 2008, Awarded $475,000.

"Miniature Turbo-pump Technology Development for Divert Propulsion Systems", Co-Principal Investigator with Principal Investigator Ahsan Choudhuri, Missile Defense Agency, Department of Defense, 2005-2007, Awarded $299,992.

"Investigation on a Novel Coaxial Microinjector with Application to Liquid Micropropulsion System", Co-Principal Investigator with Principal Investigator Ahsan Choudhuri, Missile Defense Agency, Department of Defense, 2005-2008, Awarded $599,997 with University of Maryland, UTEP share $195,000.

"Flame sysnthesis of Carbon Nanotubes using Low Calorific Value Gases", Co-Principal Investigator with Principal Investigator Ahsan Choudhuri, Department of Energy, 2005-2006, Awarded $20,000.

"Multi-Scale Modeling of NanoParticle Formation in Tobacco Smoke", Co-Principal Investigator with Principal Investigator Ahsan Choudhuri, University Tobacco Settlement Grant, June 2004 May 2005, Awarded $25,000.

Hewlett-Packard, ATP Itanium-2 Grant, 2003 - 2004, Co-Principal Investigator with Brian D'Auriol, Pat Teller, Nigel Ward, Awarded Itanium-2 Cluster.

Synergistic Activites
- Directing the Computational Mechanics Laboratory at UTEP
- Developing suite of continuum and atomistic parallel codes based on Trilinos for computational material design of high temperature materials.

Current and Past Students

Dr Ricardo Avila, PhD 2006 - Professor Universidad Autónoma de Ciudad Juárez

Ms. Elvia Renova, MS 2008 - NASA Marshal Flight Center

Ms. Harita Petla, MS 2008 -

Mr. Javed Kahn, MS 2006 -

Mr. Shekhar Bohjwani, MS 2006 -

Mr. Jonathan Valenzuela, MS 2006 -

Mr David Massilimiani, MS 2004 -