

MASOUD DARABI, PH.D., P.E.

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RESEARCH OVERVIEW/SIGNATURE CONTRIBUTION

Research focus: Nonlinear mechanistic infrastructure modeling with FAA-supported implementation of PANDA-AP for airfield pavement evaluation.

PANDA-AP (Pavement Analysis Using Nonlinear Damage Approach – Airfield Pavements) is a mechanistic computational platform developed through FAA-supported research that translates nonlinear viscoelastic–viscoplastic–damage modeling into deployable airfield pavement evaluation tools. The framework integrates material characterization, structural analysis, and performance prediction under complex aircraft loading and environmental conditions.

Impact:

- Enables physics-based evaluation of airfield pavements under next-generation aircraft loading
- Supports calibration of mechanistic evaluation methodologies within FAA initiatives
- Bridges constitutive modeling with infrastructure decision-making
- Provides computational foundation for ongoing federally funded research

Future work extends PANDA-AP toward multiscale modeling, uncertainty-informed infrastructure evaluation, and integration with sensing and digital twin frameworks.

Further Research Topics/Interest:

- **Finite Element Software Development**, Develop FE software to predict performance of roadways and airfield pavements subjected to mechanical and environmental loading conditions.
- **Asphalt Concrete Materials**, Develop experimental-computational methods to design fatigue resistance asphalt concrete materials as well as to predict performance of asphalt pavements subjected to general mechanical loading and environmental conditions.
- **Mechanics of Pavements**: Develop models and simulate multi-physics behavior of asphalt pavements involving chemical kinetics (e.g. oxidative aging), fluid flow (e.g. moisture damage and pore water pressure effects), and mechanical effects (e.g. visco-elasticity, visco-plasticity, damage, and micro-damage healing).
- **Multi-scale modeling of infrastructures**: Model the initiation and evolution of distresses through the infrastructure at multiple scales. Can be used for more sustainable design of infrastructures (e.g., asphalt and cement-based concrete pavements, bridges, and polymer-based components).
- **Material characterization**: Characterize viscoelastic, viscoplastic, damage, and micro-damage healing properties of advanced materials.
- **Micro-mechanical simulations**, which can be used in conducting virtual testing and design of sustainable infrastructure materials.

ACADEMIC APPOINTMENTS

Associate Professor, University of Kansas, Lawrence, KS, 2020-Present

Assistant Professor, University of Kansas, Lawrence, KS 2014-2020

Assistant Research Scientist 2012-2014, Texas A&M Transportation Institute (TTI), College Station, TX

Post-doctoral Research Associate 2011-2012, Texas A&M Transportation Institute (TTI), Texas A&M University, College Station, TX

Research Assistant 2008-2011, Texas A&M University, College Station, TX

Research and Teaching Assistant,

Sharif University of Technology, Tehran, Iran 2002-2005, Texas A&M Transportation Institute (TTI), College Station, TX

EDUCATIONAL HISTORY

Ph.D. (Materials) Dept. of Civil and Environmental Eng. (Aug. 2011), Texas A&M University [TAMU], College Station, TX

M.S. (Mechanics of Structures and Materials) Dept. of Civil and Environmental Eng. (Jan. 2005), Sharif University of Technology [SUT], Tehran, Iran.

B.S. (Civil Engineering) Dept. of Civil and Environmental Eng. (Jul. 2002), Graduated third in the class with honor, Sharif University of Technology [SUT], Tehran, Iran..

SPONSORED RESEARCH

Total externally funded research as PI: \$1.85M Active Funding: \$1.1M

\$425,000; FAA, 2025-2027; Enhancement and Improvement of Pavement Analysis using Nonlinear Damage Approach for Airports.

\$99,000; KDOT, 2025-2027; Calibration Pavement ME.

\$86,000, KDOT, 2025-2027; Enhancing Airport Runway Safety through Drone-Based Inspection Systems (co-PI).

\$182,000; FAA, 2024-2025; Enhancement of PANDA-AP (Pavement Analysis using Nonlinear Damage Approach for Airports).

\$93,000; KDOT, 2023-2025; Development of a database on surface free energy of asphalt binders to evaluate moisture susceptibility of asphalt mixtures used in the state of Kansas

\$88,000; KDOT, 2023-2025; A Study of the Effects of Rap modification and Aging Protocol on Delta TC Parameter for PG XX-34 and PGXX-28 Binders used in Kansas

\$73,000; Qatar Foundation, 2020-2024; Innovative Techniques for Stabilization of Qatari Soils and Petroleum Drill Cuttings Using Organic Polymers.

\$325,000; FAA, 2019-2023; Placement of PANDA-AP

\$87,000; KDOT, 2020-2022; Development of Test Procedure to Evaluate Moisture Susceptibility of Asphalt Mixtures Use in the State of Kansas, Phase I: Surface Free Energy of Binders

\$76,000; Army Corps of Engineers, 2017-2019; Computational modeling of the effect of microstructural properties on induction heating of conductive asphalt concrete

\$15,000; Texas A&M 2017-2019; Performance Prediction and Analysis of Airfield Pavements Subjected to Next Generation Aircraft

\$50,000; FAA, 2017-2019; Development of Standalone-PANDA-AP and its Application in Evaluating Damage of Aviation Pavements

\$59,000; KDOT, 2017-2019; DSR-Based Test Procedures and Specification Guidelines for Grading PG58-XX and PG64S-XX Asphalt Binders in the State of Kansas

\$184,000; FAA, 2015-2017; Performance Prediction and Analysis of Airfield Pavements Subjected to Next Generation Aircraft

\$8,000; 2016-2017 KUCR; A Computational-Experimental Framework to Evaluate Oxygen Diffusivity of Asphalt Concrete Materials

\$8,000; 2015-2016 KUCR; Effect of High Tire Pressure and Axle Configuration on Performance of Airfield Pavements

PUBLICATIONS

BOOK AND BOOK CHAPTERS

1. Little, D.N., Bhasin, A., **Darabi M.K.**, "Damage healing in asphalt pavements: Theory, mechanisms, measurements, and modeling", *Advances in Asphalt Materials, Elsevier Science, SPI-Global*, 2015.

REFEREED JOURNAL PUBLICATIONS

1. Karimi, M., **Darabi, M.K.**, "Thermodynamic-based numerical modeling of induction–microwave heating in asphalt concrete: From laboratory to field scales," *Construction and Building Materials*, Vol. 506, <https://doi.org/10.1016/j.conbuildmat.2025.144949>, 2026.
2. **Darabi, M.K.**, Rahmani, E., Masad, E., Little, D., "A coupled aging–viscoelastic–viscodamage model for predicting fatigue behavior in aged asphalt pavements," *Mechanics of Time-Dependent Materials*, Vol. 29, <https://doi.org/10.1007/s11043-025-09790-z>, 2025.
3. Khresat, G.A., **Darabi, M.K.**, Little, D.N., "Rutting performance prediction of flexible airfield pavements using nonlinear mechanistic models for asphalt and granular layers," *Transportation Geotechnics*, Vol. 52, <https://doi.org/10.1016/j.trgeo.2025.101575>, 2025.
4. **Darabi, M.K.**, Matalkeh, B.*, "The Effects of Reclaimed Asphalt Pavement Modification on the Delta Tc Parameter for PG58-XX and PG64-XX Asphalt Binders." *Construction Materials*, Vol. 5, Issue 1, <https://doi.org/10.3390/constrmater5010017>, 2025.
5. Khresat, G.A., **Darabi, M.K.**, Little, D.N., Garg, N., "Prediction of permanent deformation of granular layers in asphalt pavements with Pavement Analysis Using the Nonlinear Damage Approach—Airfield Pavements," *Transportation Research Record*, Vol. 2677, Issue 7, <https://doi.org/10.1177/036119812311536>, 2023.
6. Karimi, M.M., **Darabi, M.K.**, Rushing, J.F., Cox, B.C., "Coupled thermo-electromagnetic microstructural modeling of inductive aggregate blends," *Construction and Building Materials*, Vol. 302, Issue 4, 124107, 2021.
7. Karimi, M.M., **Darabi, M.K.**, Jahanbakhsh, H., Jahangiri, B., Rushing, J.F., "Effect of steel wool fibers on mechanical and induction heating response of conductive asphalt concrete," *International Journal of Pavement Engineering*, Volume 21, Issue 14, 1755-1768, 2020.
8. **Darabi, M.K.**, Kola, R., Little, D.N., Garg, N., "Time-dependent Drucker-Prager-Cap model coupled with PANDA (Pavement Analysis Using Nonlinear Damage Approach) to predict rutting performance of flexible pavements," *Construction and Building Materials*, Vol. 244, Issue 30, 118326, 2020.
9. Bazzaz, M., **Darabi, M.K.**, Little, D.N., Garg, N., "Effect of Evotherm-M1 on properties of asphaltic materials used at NAPMRC testing facility," *Journal of Testing and Evaluation* 48, Issue. 3, 2256-2269, 2020.
10. Sirin, O., Paul, D.K., Khan, M., Kassem, E., **Darabi, M.K.**, "Effect of Aging on Viscoelastic Properties of Asphalt Mixtures," *Journal of Transportation Engineering, Part B: Pavements*, Volume 145, Issue 4, <https://doi.org/10.1061/JPEODX.000013>, 2020.
11. **Darabi, M.K.**, Huang, C.W., Bazzaz, M., Masad, E.A., Little, D.N., "Characterization and validation of the nonlinear viscoelastic-viscoplastic with hardening-relaxation constitutive relationship for asphalt mixtures," *Construction and Building Materials*, Vol. 216, 648-660, 2019.
12. **Darabi, M.K.**, Kola, R., Little, D.N., Rahmani, E., Garg, N., "Predicting rutting performance of flexible airfield pavements using a coupled viscoelastic-viscoplastic-cap constitutive relationship," *ASCE Journal of Engineering Mechanics* 145 (2), 04018129, 2019.
13. Karimi, M.K., **Darabi, M.K.**, Tabatabaee, N., "A thermodynamic-based large deformation viscoplastic constitutive relationship for asphalt concrete compaction," *International Journal of Solids and Structures*, Vol. 165, 192-216, 2019.
14. Misra, A., Singh, V., **Darabi, M.K.**, "Asphalt pavement rutting simulated using granular micromechanics-based rate-dependent damage-plasticity model," *International Journal of Pavement Engineering*, Vol 20(9), 1012-1025, 2019.
15. Bazzaz, M., **Darabi, M.K.**, Little, D.N., Garg, N., "A straightforward procedure to characterize nonlinear viscoelastic response of asphalt concrete at high temperatures," *Transportation Research Record* 2672 (28), 481-492, 2018.
16. Kim, S.M., **Darabi, M.K.**, Little, D.N., Abu Al-Rub, R.K., "Effect of the realistic tire contact pressure on the rutting performance of asphaltic concrete pavements," *KSCCE Journal of Civil Engineering* 22 (6), 2138-2146, 2018.
17. **Darabi, M.K.**, Abu Al-Rub, R.K., Omid, O., "A thermodynamically consistent framework to derive local/nonlocal generalized nonassociative plasticity/viscoplasticity theories," *International Journal of Plasticity*, in press, 2018.
18. Caro, S., Castillo, D., **Darabi, M.K.**, Masad, E., "Influence of different sources of microstructural heterogeneity on the degradation of asphalt mixtures," *International Journal of Pavement Engineering*, Vol. 19(1), 9-23, 2018.
19. **Darabi, M.K.**, Rahmani, E., Little, D.N., Masad, E.A., Rushing, J.F., "A computational-experimental method to determine the effective diffusivity of asphalt concrete," *ASCE Journal of Engineering Mechanics*, Vol. 143(9), 04017076, 2017.

20. Rahmani, E., **Darabi, M.K.**, Little, D.N., Masad, E.A., "Constitutive modeling of coupled aging-viscoelastic response of asphalt concrete," *Construction and Building Materials*, Vol. 131, 1-15, 2017.
21. Rushing, J.F., **Darabi, M.K.**, Rahmani, E., Little, D.N., "Comparing rutting of airfield pavements to simulations using Pavement Analysis using Nonlinear Damage Approach (PANDA), *International Journal of Pavement Engineering*, Vol. 18(2), 138-159, 2017.
22. Karimi, M., Tabatabaee, N., Jahangiri, B., **Darabi, M.K.**, "Constitutive modeling of hardening-relaxation response of asphalt concrete in cyclic compressive loading," *Construction and Building Materials*, Vol. 137, 169-184, 2017.
23. Shakiba, M., **Darabi, M.K.**, Little, D.N., "Effect of pore water pressure on the response of asphalt concrete," *Transportation Research Record: Journal of the Transportation Research Board*, N. 2631, 114-122, 2017.
24. Castillo, D., Caro, S., **Darabi, M.K.**, Masad, E., "Influence of aggregate morphology on the mechanical performance of asphalt mixtures," *Road Materials and Pavement Design*, 1-20, 2017.
25. Castillo, D., Caro, S., **Darabi, M.K.**, Masad, E., "Modelling moisture-mechanical damage in asphalt mixtures using random microstructures and a continuum damage formulation," *Road Materials and Pavement Design*, Vol. 18(1), 1-21, 2017.
26. Shakiba, M., **Darabi, M.K.**, Abu Al-Rub, R.K., "A thermodynamic framework for constitutive modeling of coupled moisture-mechanical induced damage in partially saturated viscous porous media," *Mechanics of Materials*, Vol. 96, 53-75, 2016.
27. Castillo, D., Caro, S., **Darabi, M.K.**, Masad, E., "Studying the effect of microstructural properties on the mechanical degradation of asphalt mixtures," *Construction and Building Materials*, Vol. 93, 70-83, 2015.
28. Shakiba, M., **Darabi, M.K.**, Abu Al-Rub, R.K., You, T., Little, D.N., "Three-dimensional microstructural modeling of coupled moisture -mechanical response of asphalt concrete, *International Journal of Pavement Engineering*, Vol. 16 (5), 445-466, 2015.
29. Shakiba, M., **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Constitutive modeling of the coupled moisture-mechanical response of composite materials with application to asphalt concrete, *ASCE Journal of Engineering Mechanics*, Vol. 141(2), 04014120, 1-16, 2015.
30. Abu Al-Rub, R.K., Tehrani, A.H., **Darabi, M.K.**, " Application of a large deformation nonlinear-viscoelastic viscoplastic viscodamage constitutive model to polymers and their composites," *International Journal of Damage Mechanics*, Vol. 24(2), 198-244 , 2015.
31. Mehrez, L., **Darabi, M.K.**, Ghanem, R., Masad, E., Little, D., "Modeling and propagation of stochastic linear viscoelastic material properties of asphalt mixtures in pavement structures". *Proceedings of the 9th International Conference on Structural Dynamics*, EUROLYN 2014, 2745-2752, 2014.
32. Shakiba, M., **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Microstructural modeling of asphalt concrete using a coupled moisture-mechanical constitutive relationship," *International Journal of Solids and Structures*, Vol. 51, 4260-4279, 2014.
33. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E. A., Little, D.N., " Constitutive modeling of fatigue damage response of asphalt concrete materials with consideration of micro-damage healing," *International Journal of Solids and Structures*, Vol. 50, 2901-2913, 2013.
34. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E. A., Little, D.N., " A cyclic hardening-relaxation viscoplastic model for asphalt concrete materials," *ASCE Journal of Engineering Mechanics*, Vol. 139, 832-847, 2013.
35. Abu Al-Rub, R.K., **Darabi, M.K.**, Kim, S.M., Little, D.N., Glover, C. J, "Mechanistic-based constitutive modeling of aging in hot asphalt mixtures and its effect on the cracking potential and fatigue life of asphaltic pavements," *Construction and Building Materials*, Vol. 41, 439-454, 2013.
36. Rahmani, E., **Darabi, M.K.**, Abu Al-Rub, R.K., Kassem, E., Masad, E.A., Little, D.N., "Effect of confinement pressure on the nonlinear-viscoelastic response of asphalt concrete at high temperatures," *Construction and Building Materials*, Vol. 47, 779-788, 2013.
37. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Constitutive modeling of fatigue damage response of asphalt concrete materials," *Transportation Research Board*, Vol. 2373-02, 11-21, 2013.
38. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Constitutive modeling of cyclic viscoplastic response of asphalt concrete," *Transportation Research Board*, Vol. 2373-03, 22-33, 2013.

39. Shakiba, M., Abu Al-Rub, R.K., **Darabi, M.K.**, You, T., Masad, E.A., Little, D.N., "A continuum coupled moisture-mechanical damage model for asphalt concrete," *Transportation Research Board, Transportation Research Record* 2372, Vol. 3, 72-83, 2013.
40. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Huang, C.W., Little, D.N., "A modified viscoplastic model to predict the permanent deformation of asphaltic materials under cyclic-compression loading at high temperatures," *International Journal of Plasticity*, Vol. 35, 100-134, 2012. ([Among Top 25 Hottest Articles, IJP](#)).
41. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "A thermodynamic framework for constitutive modeling of time- and rate-dependent materials, Part II: Numerical aspects and application to asphalt concrete," *International Journal of Plasticity*, Vol. 35, 67-99, 2012.
42. Abu Al-Rub, R.K., **Darabi, M.K.**, "A thermodynamic framework for constitutive modeling of time- and rate-dependent materials, Part I: Theory," *International Journal of Plasticity*, Vol. 34, 61-92, 2012. ([Among Top 25 Hottest Articles, IJP](#)).
43. **Darabi, M.K.**, Abu Al-Rub, R.K., Little, D.N., "A Continuum damage mechanics-based framework for modeling micro-damage healing," *International Journal of Solids and Structures*, Vol. 49, No. 3-4, 492-513, 2012, ([Among Top 25 Hottest Articles, IJSS](#)).
44. You, T., Abu Al-Rub, R.K., **Darabi, M.K.**, Masad, E.A., Little, D.N., "Three dimensional microstructural modeling of asphalt concrete using a unified viscoelastic-viscoplastic-viscodamage model," *Construction and Building Materials*, Vol. 28, No. 1, 531-548, 2012.
45. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Thermodynamic based model for temperature-dependent viscoelastic, viscoplastic, and viscodamage constitutive behavior of bituminous materials," *International Journal for Numerical and Analytical Methods in Geomechanics*, Vol. 36, 817-854, 2012.
46. Abu Al-Rub, R.K., **Darabi, M.K.**, Huang, C.W., Masad, E.A., Little, D.N., "Comparing finite element and constitutive modeling techniques for predicting rutting of asphalt pavements," *International Journal of Pavement Engineering*, Vol. 13, No. 4, 322-338, 2012.
47. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "A thermo-viscoelastic-viscoplastic-viscodamage constitutive model for asphaltic materials," *International Journal of Solids and Structures*, Vol. 48, No. 1, 191-207, 2011, ([Among Top 25 Hottest Articles, IJSS](#)).
48. Abu Al-Rub, R.K., **Darabi, M.K.**, You, T., Masad, E.A., Little, D.N., "A unified continuum damage mechanics model for predicting mechanical response of asphalt mixtures and pavements," *International Journal of Roads and Airports*, Vol. 1, No. 1, 68-84, 2011.
49. Abu Al-Rub, R.K., **Darabi, M.K.**, Little, D.N., Masad, E.A., "A micro-damage healing model that improves prediction of fatigue life in asphalt mixes," *International Journal of Engineering Science*, Vol. 48, No. 11, 966-990, 2010, ([Among Top 25 Hottest Articles, IJES](#)).
50. Abu Al-Rub, R.K., **Darabi, M.K.**, Masad, E.A., "A straightforward numerical technique for finite element implementation of nonlocal gradient-dependent continuum damage mechanics theories," *International Journal of Theoretical and Applied Multiscale Mechanics*, Vol. 1, No. 4, 352-385, 2010.
51. Rafii-Tabar, H., Shodja, H.M., **Darabi, M.K.**, Dahi, A., "Molecular dynamics simulation of crack propagation in fcc materials containing clusters of impurities," *Mechanics of Materials*, Vol. 38, No. 3, 243-252, 2006, ([Among Top 25 Hottest Articles, MOM](#)).

CONFERENCE ARTICLES AND PRESENTATIONS

1. **Darabi, M.K.**, Verma, P., "Development of test procedures to evaluate moisture susceptibility of asphalt mixtures used in the state of Kansas, Phase I: Surface free energy of binders," *Transportation Research Board (TRB)*, January 2026, Washington D.C., 2026.
2. **Darabi, M.K.**, "Mechanistic-Based Modeling of Performance of Flexible Airfield Pavements." ASCE Engineering Mechanics Institute, Anaheim, CA, May 2025.
3. **Darabi, M.K.**, Khresat, G.A., "Prediction of permanent deformation of granular layers in asphalt pavements with Pavement Analysis Using the Nonlinear Damage Approach—Airfield Pavements," *Transportation Research Board (TRB)*, January 2023, Washington D.C., 2023.
4. **Darabi, M.K.**, Khresat, G.A., "Prediction of permanent deformation of asphalt pavements with thin asphalt concrete layer," *Society of Engineering Science (SES)*, College Station, TX, 2022.

5. **Darabi, M.K.**, Karimi, M.M., "Induction heating of asphalt concrete," ASCE Engineering Mechanics Institute (EMI), May 29-June 1, Boston, MA, 2018.
6. **Darabi, M.K.**, Kola, R., Little, D.N., Garg, N., "Time-Dependent Drucker-Prager-CAP Model Coupled with PANDA (Pavement Analysis using Nonlinear Damage Approach) to Predict Rutting Performance of Airfield Pavements," ASCE Engineering Mechanics Institute (EMI), May 29-June 1, Boston, MA, 2018.
7. **Darabi, M.K.**, Bazzaz, M., "A straightforward procedure to characterize nonlinear viscoelastic response of asphalt concrete at high temperatures," Transportation Research Board, January 13-17, Washington D.C., 2018.
8. **Darabi, M.K.**, Karimi, M.M., "Constitutive modeling of intrinsic cross-anisotropic viscoelastic response of asphalt concrete," ASCE Engineering Mechanics Institute (EMI), June 4-7, San Diego, CA, 2017.
9. **Darabi, M.K.**, Kola, R., Little, D., Garg, N., "Predicting rutting performance of flexible airfield pavements using enhanced PANDA-AP: Pavement Analysis using Nonlinear Damage Approach," ASCE Engineering Mechanics Institute (EMI), June 4-7, San Diego, CA, 2017.
10. **Darabi, M.K.**, Rushing, J.F., Rahmani, E., Kola, R., Little, D.N., "Rutting Performance Prediction and Analysis of Airfield Pavements Subjected to Next Generation Aircraft," ASCE Engineering Mechanics Institute (EMI), May 22-25, Nashville, TN, 2016.
11. **Darabi, M.K.**, Rahmani, E., Little, D.N., Masad, E., "A Computational-Experimental Framework to Estimate Transport Properties of Multi-Phase Composites," ASCE Engineering Mechanics Institute (EMI), Nashville, TN, 2016.
12. **Darabi, M.K.**, "Modeling the coupled mechanical-environmental response of asphalt pavements using Pavement Analysis using Nonlinear Damage Approach (PANDA)," *Transportation Research Board*, Jan 10-14, Washington, D.C., 2016.
13. **Darabi, M.K.**, "Constitutive modeling and characterization of coupled viscoelastic-viscoplastic-viscodamage response of asphalt concrete subjected to realistic loading scenarios," *Transportation Research Board*, Jan 11-15, Washington, D.C., 2015.
14. **Darabi, M.K.**, Little, D.N., Abu Al-Rub, R.K., Masad, E.A., "Modeling the response of asphalt concrete using PANDA model: Pavement Analysis using Nonlinear Damage Approach," *Transportation Research Board*, Jan 12-16, Washington, D.C., 2014.
15. Mehrez, L., **Darabi, M.K.**, Ghanem, R., Masad, E., Little, D., "Modeling and propagation of stochastic linear viscoelastic material properties of asphalt mixtures in pavement structures," *Proceedings of the 9th International Conference on Structural Dynamics, EUROLYN*, Porto, Portugal, June 30-July 2, Porto, Portugal, 2014.
16. **Darabi, M.K.**, You, T., Abu Al-Rub, R.K., Kassem, E., Masad, E.A., Little, D.N., "Modeling the fatigue damage response of asphalt concrete at multiple scales," *Thirteen Pan-American Congress of Applied Mechanics*, May 22-24, Houston, TX, 2013.
17. **Darabi, M.K.**, E., Masad, E.A., Little, D.N., "A cyclic hardening-relaxation viscoplastic model for asphalt concrete pavements," *Thirteen Pan-American Congress of Applied Mechanics*, May 22-24, Houston, TX, 2013.
18. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Constitutive modeling of fatigue damage response of asphalt concrete materials," *Transportation Research Board*, 92nd Annual Meeting, January 13-17, Washington, D.C., 2013.
19. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "Constitutive modeling of cyclic viscoplastic response of asphalt concrete," *Transportation Research Board*, 92nd Annual Meeting, January 13-17, Washington, D.C., 2013.
20. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "A cyclic hardening-relaxation viscoplastic model that enhances the prediction of permanent deformation of asphalt concrete pavements," In. Joint Conference of the Engineering Mechanics Institute and the 11th ASCE Joint Specialty Conference (EMI/PMC), Notre Dame, IN, June 17-21, 2012.
21. **Darabi, M.K.**, Abu Al-Rub, R.K., Little, D.N., "A general continuum damage mechanics framework for constitutive modeling of micro-damage healing," In. Joint Conference of the Engineering Mechanics Institute and the 11th ASCE Joint Specialty Conference (EMI/PMC), Notre Dame, IN, June 17-21, 2012.
22. **Darabi, M.K.**, Abu Al-Rub, R.K., "A thermodynamic framework for coupling viscoelastic, viscoplastic, viscodamage, and micro-damage healing constitutive behavior of time- and rate-dependent materials," In. Joint Conference of the Engineering Mechanics Institute and the 11th ASCE Joint Specialty Conference (EMI/PMC), Notre Dame, IN, June 17-21, 2012.
23. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., Little, D.N., "A continuum-based micro-damage healing model for asphalt concrete," In. Engineering Mechanics Institute (EMI), Northeastern University, Boston, MA, June 2-4, 2011.

24. **Darabi, M.K.**, Ettehad, M., Abu Al-Rub, R.K., "Predicting size and interfacial effects in metallic thin films and micro/nano pillars using thermodynamically consistent nonlocal gradient plasticity theories," In. Engineering Mechanics Institute (EMI), Northeastern University, Boston, MA, June 2-4, 2011.
25. Abu Al-Rub, R.K., **Darabi, M.K.**, "On the thermodynamic consistency of higher-order gradient plasticity theory for predicting size effects," In. ASME International Mechanical Engineering Congress & Exposition, IMECE, 2010-39193.
26. **Darabi, M.K.**, Abu Al-Rub, R.K., "A direct finite element implementation of gradient-dependent continuum damage mechanics theories," In. Engineering Mechanics Institute (EMI), University of Southern California, Los Angeles, CA, August 8-11, 2010.
27. **Darabi, M.K.**, Abu Al-Rub, R.K., "A thermodynamic based constitutive model capturing temperature-, time-, and rate-dependent behavior of bituminous materials," In. Engineering Mechanics Institute (EMI), University of Southern California, Los Angeles, CA, August 8-11, 2010.
28. **Darabi, M.K.**, Abu Al-Rub, R.K., "Thermodynamic based higher-order gradient plasticity captures size and interfacial effects at the micron and submicron length scales, " In. 47th Annual Technical meeting of the Society of the Engineering Science (SES), Iowa State University, Ames, IA, October 4-6, 2010.
29. **Darabi, M.K.**, Abu Al-Rub, R.K., "A thermodynamic based framework for modeling the coupled viscoelastic, viscoplastic, and viscodamage behavior of soft materials," In. 47th Annual Technical meeting of the Society of the Engineering Science (SES), Iowa State University, Ames, IA, October 4-6, 2010.
30. **Darabi, M.K.**, Abu Al-Rub, R.K., "On the Thermodynamic Consistency of Higher-Order Gradient Plasticity Theory," In. 16th US National Congress of Theoretical and Applied Mechanics, USNCTAM, 2010-1257.
31. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E.A., "A Straightforward Numerical Technique for Finite Element Implementation of Nonlocal Gradient-Dependent Continuum Damage Mechanics Theories," In. 16th US National Congress of Theoretical and Applied Mechanics, USNCTAM, 2010-991.

REPORTS

1. **Darabi, M.K.**, "Numerical simulation of the effect POLYMER STABILIZATION OF subgrade on the performance of ASPHALT pavements subjected to traffic and wet-dry cycles", Qatar Research Foundation, 2025.
2. **Darabi, M.K.**, "A Study on the Effects of RAP modification and aging protocol on ΔT_c parameter for PG XX-34 and PG XX-28 binders used in Kansas", Kansas Department of Transportation, 2025.
3. **Darabi, M.K.**, "Development of test procedures to evaluate moisture susceptibility of asphalt mixtures used in the state of Kansas, Phase I: Surface free energy of binders," Kansas Department of Transportation, 2025.
4. **Darabi, M.K.**, "Pavement Analysis Using Nonlinear Damage Approach: User Manual," Federal Aviation Administration, 2025.
5. **Darabi, M.K.**, "DSR-Based Test Procedures and Specification Guidelines for Grading PG 58-XX and PG 64S-XX Asphalt Binders in Kansas," Kansas Department of Transportation, 2024.
6. **Darabi, M.K.**, "Pavement Analysis Using Nonlinear Damage Approach: Theory Manual," Federal Aviation Administration, 2024.
7. **Darabi, M.K.**, "Pavement Analysis Using Nonlinear Damage Approach: User Manual," Federal Aviation Administration, 2024.
8. **Darabi, M.K.**, "Pavement Analysis Using Nonlinear Damage Approach: Example Manual," Federal Aviation Administration, 2024.
9. **Darabi, M.K.**, "Development of test procedures to evaluate moisture susceptibility of asphalt mixtures used in the state of Kansas, Phase I: Surface free energy of binders," Kansas Department of Transportation, 2023.
10. **Darabi, M.K.**, "Microstructural Analysis of the Effect of Size-distribution and Geometry of Steel Particles on Induction Heating of Asphalt Mixtures," Army Corps of Engineers, 2019.
11. **Darabi, M.K.**, Little, D.N., "Performance Prediction of Airfield Pavements subjected to Next Generation Aircraft," Federal Aviation Administration (FAA), 2019.
12. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E., Little, D., Kassem, E., Kim, S-M, Shakiba, M., Rahmani, E., "PANDA: Pavement Analysis Using Nonlinear Damage Approach," Federal Highway Administration (FHWA), 2016.
13. **Darabi, M.K.**, Kassem, E., Abu Al-Rub, R.K., Masad, E., Little, D., "AASHTO Standard Methods and Required Tests for Calibration of the Pavement Analysis using Nonlinear Damage Approach (PANDA) Constitutive Models," Federal Highway Administration (FHWA), 2016.

14. **Darabi, M.K.**, Abu Al-Rub, R.K., Masad, E., Little, D., Kassem, E., Kim, S-M, Shakiba, M., Rahmani, E., "PANDA: Pavement Analysis Using Nonlinear Damage Approach," Federal Highway Administration (FHWA), 2013.
15. **Darabi, M.K.**, Kassem, E., Abu Al-Rub, R.K., Masad, E., Little, D., "AASHTO Standard Methods and Required Tests for Calibration of the Pavement Analysis using Nonlinear Damage Approach (PANDA) Constitutive Models," Federal Highway Administration (FHWA), 2013.

SOFTWARE DEVELOPMENT AND RESEARCH PRODUCTS

PANDA-AP (2025): Pavement Analysis using Nonlinear Damage Approach: Airfield Pavements (PANDA-AP). PANDA-AP is the most comprehensive mechanistic-based model available for predicting the performance of asphalt pavements under traffic loading and environmental conditions. The model incorporates various material constitutive relationships to characterize the susceptibility of asphalt mixtures to mechanical stresses and environmental factors. The **Federal Aviation Administration (FAA)** has sponsored the development of PANDA-AP into a standalone software tool that can be utilized by FAA contractors and engineers for refined analysis of airfield pavements subjected to next-generation aircraft. This software will enable pavement design engineers to analyze and predict the performance of pavements made from different material combinations, helping them to select the most cost-effective and durable materials for proposed projects. Additionally, PANDA-AP serves as a valuable tool for sustainable pavement design. It allows engineers to evaluate the impact of alternative materials (e.g., geo-synthetics, polymer-modified asphalt, or active fillers in asphalt binders) and strategies on pavement performance. By leveraging these capabilities, PANDA-AP supports the design of more efficient, cost-effective, and environmentally sustainable airfield pavements.

INVITED TALKS

"PANDA-AP Enhancement"

Presentation, Federal Aviation Administration, June 2025.

"A mechanistic-based model to predict performance of airfield pavements,"

Kent Seminars, University of Illinois Urbana Champaign, Feb 2024.

"Nonlinear elasto-plastic analysis of airfield pavements."

Federal Aviation Administration, 2024.

"Standalone software Pavement Analysis using Nonlinear Damage Approach: PANDA-AP,"

Federal Aviation Administration, Oct 2023.

"How to predict rutting performance of Airfield Pavements,"

Federal Aviation Administration, 2022.

"Development of a user friendly interface for standalone-PANDA-AP software,"

Federal Aviation Administration, 2021.

"Implementation of Pavement Analysis using Nonlinear Damage Approach,"

Asphalt Research Consortium Workshop, Transportation Research Board, Jan 15, Washington, D.C., 2015.

"Constitutive modeling and characterization of coupled viscoelastic-viscoplastic-viscodamage response of asphalt concrete subjected to realistic loading scenarios,"

Transportation Research Board, Jan 14, Washington, D.C., 2015.

"A Novel Experimental-Computational Tool to Preserve and Advance Roadways"

Kansas Department of Transportation, Topeka, KS, September 2014.

"PANDA: A Tool for Design of Roadway and Airfield Pavement Materials and Structures"

U.S. Army Corps of Engineering, Waterways Experiment Station, Vicksburg, MS, August 2014.

"Standalone-PANDA: A Tool for Structural and Material Design"

Federal Highway Administration (FHWA), July 2014.

“Development/Implementation of Multi-Physics Constitutive Relationships for Particulate Composite Materials”

Texas A&M University at Qatar, Doha, Qatar, May 2014.

“Chemo-Hygro-Mechanical Modeling of Advanced Infrastructure Materials”

The University of Kansas, Lawrence, KS, March 2014.

“Thermo-Chemo-Hygro-Mechanical Modeling of Asphalt Concrete at Macro and Micro Scales”

The University of Wisconsin-Madison, Madison, WI, December 2013.

“Recent Developments in Mechanics and Materials Science of Asphalt Concrete”

The University of Wisconsin-Madison, Madison, WI, December 2013.

“Pavement Analysis using Nonlinear Damage Approach (PANDA)”

FHWA Workshop on Modeling of Asphalt Materials and Pavements, McLean, VA, October 2013.

“Pavement Analysis using a Nonlinear Damage Approach (PANDA) to predict the performance of asphalt pavements”

FHWA Fundamental Properties and Advanced Models Expert Task Group, Baton Rouge, LA, March 22, 2012.

“Continuum Damage-Healing Framework for Modeling Self-Healing Materials”

Texas A&M University at Qatar, Doha, Qatar, June 2, 2012.

TEACHING EXPERIENCE**University of Kansas, Lawrence, KS**

CE 861-Finite Element Method; Spring 2026

CE 710-Structural Mechanics; Fall 2015-2025

CE 484- Materials for Transportation Facilities; Spring 2015-2026

CE 310- Strength of Materials, Fall 2014-2024

TAMU, Department of Civil and Environmental Engineering, College Station, TX

Guest Lecturer, *Damage Mechanics of Solids and Structures* (Fall 2010 - Fall 2013)

Guest Lecturer, *Design of Pavement Structures* (Fall 2010-Fall 2013)

Short Course on Advanced Constitutive Modeling of Bituminous Materials (Spring 2011)

SUT, Department of Civil and Environmental Engineering, Tehran, Iran

Teaching Assistant, *Design of Steel Structures I* (Fall 2004)

Teaching Assistant, *Dynamics* (Spring 2003)

EDITORIAL AND PROFESSIONAL LEADERSHIP**Professional Engineer, P.E., 2019-Present**

Associate Editor, *ASCE Journal of Transportation Part B: Pavements*, 2016-Present

Guest Editor, *Frontiers in Built Environment*, 2025-Present

Member

- *Academy of Pavement Science and Engineering*
- *Mechanics of Pavements Committee, Engineering Mechanics Institute (EMI), ASCE*
- *Modeling Inelasticity & Multiscale Behavior Committee, Engineering Mechanics Institute (EMI), ASCE*
- *Computational Mechanics Committee, Engineering Mechanics Institute (EMI), ASCE, 2014-Present*

Co-Organizer “Annual Asphalt Paving Conference”, KU, 2014-Present

Co-Organizer “Geotechnical Engineering Conference”, KU, 2014-Present

Member, Department hiring Committee, 2024-2025

Member, Faculty Senate, 2024-Present

Member, University Senate, 2024-Present

Member, Awards Committee, CEAE Department, KU, 2025-Present

Updated: 2-2026

Roy J. Leonard Chair's Council Associate Professor, 2023-Present

Chair's Council Assistant Professor, 2019-2020

Member, University of Kansas Engineering Senate Committee, 2017-2019

Organizer "Coupled Environmental-Mechanical Response of Civil Infrastructures and Materials", ASCE EMI Symposium, San Diego, CA, 2017

Session Chair "Coupled Environmental-Mechanical Response of Civil Infrastructures and Materials" In: ASCE Engineering Mechanics Institute Conference (EMI), San Diego, CA., 2017

Organizer, "Workshop on Pavement Analysis using Nonlinear Damage Approach (PANDA)," Texas A&M University, College Station, TX., 2013

Representative of the Material Division, Association of Civil Engineering Doctoral Students, Texas A&M University, 2010-2011

Session Chair "Damage Mechanics of Solids and Structures" In: 16th US National Congress on Theoretical and Applied Mechanics (USNCTAM), June 27—July 2, State College, Pennsylvania, USA, 2010

Co-Chair "Size Scale Effects in Micro/Nano-Structured Materials and Composites" In: 47th Annual Technical Meeting of Society of Engineering Science (SES), October 3-6, 2010, Iowa State University, Ames, IW, USA., 2010

Reviewer for: ASCE Journal of Materials in Civil Engineering; International Journal of Pavement Engineering; Construction and Building Materials; ASCE Journal of Engineering Mechanics. ASCE Journal of Transportation, Part B: Pavements; International Journal of Solids and Structures; International Journal of Plasticity., 2011-Present

AWARDS AND HONORS

- Best Scientific Paper Award, Road Materials and Pavement Design an International Journal, 2018.
- Graduate Student Award for Excellence in Doctoral-Level Research, 2012.
- Finalist, student paper competition, Engineering Mechanics Institute (EMI), 2012.
- The best presentation, student paper competition, Civil Engineering Student Research Symposium, Texas A&M University, 2011.
- Top 10 Hottest Articles, IJSS 48, No. 1, 191-207, 2011.
- Finalist, student paper competition, Society of Engineering Science (SES), 2010.
- Finalist, student paper competition, Engineering Mechanics Institute (EMI), 2010.
- The best presentation in pavement symposium, Engineering Mechanics Institute (EMI), 2010.
- Top 10 Hottest Articles, IJES 48, No. 11, 966-990, 2010.
- SIAWE (Society of Iranian-American Women for Education) Scholarship, 2009-2011.
- Ph.D. student scholarship from Texas A&M University, 2008.
- Ranked 3rd in Scientific Olympiad University Students of Iran in Civil Engineering among more than 11,000 students, National level, 2002.

INDUSTRY EXPERIENCE

Alisaz International Company, Tehran, Iran.

Site Engineer/Engineering Manager (Aug. 2005- Aug. 2008)

Responsible for engineering design, and construction of a cement plant.

Bidding for contracts.

Responsible for company invoices.