

Saud A. Khashan, PhD.

Associate Professor

Mechanical Engineering Department, United Arab Emirates University, P.O. Box 15551, Al-Ain- UAE

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EDUCATION:

PhD. (1998), Mechanical Engineering, University of Pittsburgh, PA, USA.

MS. (1993), Mechanical Engineering, Jordan University of Science and Technology, Jordan

BSC. (1989) Mechanical Engineering, Jordan University of Science and Technology, Jordan

EMPLOYMENT:

Associate Professor, Mechanical Engineering Department, United Arab Emirates University (Sep. 2006-present)

Assistant Professor, Mechanical Engineering Department, United Arab Emirates University (Sep. 2000-Sep.2006)

Post-Doctoral Fellow, Petroleum Development Lab, School of Mineral Engineering, University of Alaska Fairbanks. USA. (Jan. 1999 – Sep. 2000)

RESEARCH & SCHOLAR ACTIVITY:

Research Interests:

Microfluidics and Nanofluidics, Biotechnology, Bioassays, Magnetophoresis, Micro and Nano heat transfer, Bio heat and mass transfer, porous media, biomagnetic fluid dynamics.

CFD theory: FVM, FEM, super computation and parallel processing, geometrical modeling and grid generation, discretization schemes, numerical visualizations, numerical stability and accuracy.

CFD Applications: Transport Porous media, , Oil-Reservoir simulation, Biomagnetic fluid Dynamics, Magnetic Hyperthermia for Cancer Treatment, Biological heat transfer, non-Newtonian flow, Conjugated heat transfer, Micro heat and mass transfer, Thermal and thermodynamics characterization of phase-change materials, Industrial forced and natural ventilation, Turbulence Modeling, Turbo-machinery, Solar Energy, Contaminant Hydrology.

Experimental fluid mechanics and heat transfer: Color PIV, Thermal Imaging and Photometric and Radiometric Analysis

Teaching: Undergraduate: Fluid mechanics, Heat Transfer, Intermediate Heat Transfer, Engineering Thermodynamics, Applied Thermodynamics, Turbomachinery, Propulsion systems, Mechanical Engineering Analysis, Thermofluid System Design and Analysis, Foundations of Aerodynamics. Differential Equations and Engineering Applications
Graduate: Thermodynamics of Materials, Advanced Mechanical Analysis, Advanced Mathematics for Engineers, Advanced Heat Transfer, Advanced Computational Methods for Engineers.

Selected peer-refereed Publications:

A- Journals

1. **Saud A. Khashan**, Anas Alazzam and Edward Furlani, Computational Analysis of Enhanced Magnetic Bioseparation in Microfluidic Systems with Flow-Invasive Magnetic Elements, *Scientific Reports* **4** : 5299 | DOI: 10.1038/srep05299 (2014).
<http://www.nature.com/srep/2014/140616/srep05299/full/srep05299.html>
2. **Saud A. Khashan** and Edward Furlani, Scalability analysis of magnetic bead separation in a microchannel with an array of soft magnetic elements in a uniform magnetic field, *Separation and Purification Technology* **125**, 311-318 (2014).
3. Munjed A. Maraqa and **Saud A. Khashan**, Modeling solute transport affected by heterogeneous sorption kinetics using single-rate nonequilibrium approaches, *Journal of Contaminant Hydrology*, **157**, 73–86 (2014)

4. **Saud A. Khashan** and Edward Furlani, Coupled Particle-Fluid Transport and Magnetic Separation in Microfluidic Systems with Passive Magnetic Functionality, *J. Phys. D: Appl. Phys.* **46**, pp.125002 (15pp), 2013.
5. E Elnajjar, Y Haik, MO Hamdan, **S. Khashan**, Heat transfer characteristics of multi-walled carbon nanotubes suspension in a developing channel flow, *Heat and Mass Transfer* **49** , 1681-1687 (2013).
6. **Saud A. Khashan** and Edward Furlani, Effects of Particle-Fluid Coupling on Particle Transport and Capture in a Magnetophoretic Microsystem, *Microfluidics and Nanofluidics* **12**, pp.565-580, 2012.
7. **Saud A. Khashan**, Yousef Haik and Emad Elnajjar, CFD simulation for Biomagnetic Separation involving Dilute Suspensions, *Canadian Journal for Chemical Engineering*. **90**(6), pp. 1450-1456, 2012.
8. **Saud A. Khashan**, Emad Elnajjar and Yousef Haik. Numerical Simulation of the Continues Biomagnetic Separation in a Two-dimensional Channel, *International Journal of Multiphase Flow* **37**, pp. 947–955, 2011
9. **Saud A. Khashan**, Emad Elnajjar and Yousef Haik, CFD Simulation of the Magnetophoretic Separation in a Microchannel, *Journal of Magnetism and Magnetic Materials* **323**, pp. 2960–2967, 2011.
10. **Saud. A. Khashan** and Y. Haik, Numerical Simulation of Bio-magnetic Fluid Downstream an Eccentric Stenotic Orifice, *Physics of Fluids*. Vol. **18** (11), pp.113601, 2006.
11. **S. A. Khashan**, A.M. Al-Amiri and Ioan Pop, Numerical Simulation of Natural Convection Heat Transfer in a Porous Cavity Heated From Below Using a Non-Darcian, Thermal Non-Equilibrium Model, *Int. J. of Heat & Mass Transfer*. Vol. **49** (5-6), pp. 1039-1049, 2006.
12. **S. A. Khashan** and M.A. Al-Nimr, Validation of the Local thermal equilibrium assumption in forced convection of non-Newtonian fluid through a porous channel, *Transport in Porous Media*. Vol. **61**(3), pp. 291-305, 2005.
13. **S. A. Khashan**, An improved Interpolation Scheme for Finite-Volume, Pressure-Correction Methods in Complicated Geometries, *International Journal of Pure and Applied Mathematical Science*, Vol. **2**(1), pp. 102-117, 2005.
14. **S. A. Khashan**, A.M. Al-Amiri and M.A. Al-Nimr, Assessment of the local thermal non-equilibrium condition in developing forced convection flows through fluid-saturated porous tubes. *Applied Thermal Engineering*, Vol. **25**(10), pp. 1429-1445, 2005.
15. **S. A. Khashan** and A.M. Alteraifi, Steady-states versus time accurate simulations for sub-critical flows around circular cylinder, *Computational Fluid Dynamics Journal*. Vol.**13**, pp.70-78, 2004.
16. **S. A. Khashan**, Ogbe, D.O., and Jiang, T.M, Development and optimization of Parallel Code for Large-scale Petroleum Reservoir Simulation, *Journal of Canadian Petroleum Technology*, Vol. **41**, No. **4**. pp. 33, 2002.
17. K. Al-Jamal, **S. Khashan**, Effect of Energy Extraction on Solar Pond Performance, *Energy Conversion and Management Journal*. Vol.**39**, No.**7**, pp.559-566, 1998.
18. K. Al-Jamal, **S. Khashan**, Parametric Study of Solar Pond in Northern Jordan, *Energy*. Vol.**21**, pp. 939-946, 1996.

B. Conference Proceedings

1. **Saud A. Khashan** and Edward Furlani, Numerical Analysis of Microfluidic Magnetic Bead Separation Utilizing an Integrated Array of Magnetic Elements Magnetized by a Homogenous Bias Field, Technical Proceeding of the 2013 NSTI-Nanotechnology, NSTI-Nanotech 2013; **2**: 289-292, 2013.
2. **S. A. Khashan** and E. P. Furlani, Modeling Particle-Fluid Coupling and its Impact on Magnetic Particle Transport in Microfluidic Systems, Technical Proceeding of the 2012 NSTI-Nanotechnology, NSTI-Nanotech 2012. 408-411, 2012.

3. **Saud A. Khashan**, Anas AlAzzam and Edward Furlani ,A Novel Design for a Microfluidic Magnetophoresis System: Computational Study, Proceedings of the 12th International Conference on Fluid Control, Measurements and Visualization FLUCOME2013, Nara, Japan, November 18-23, 2013.
4. Anas Alazzam, Bobby Mathew, Saud Khashan and Bashar El-Khasawneh, Tracking Microparticles Subjected to Dielectrophoresis in a Continuous Flow Microdevice, Bio Engineering Conference BIO ENG '14, Istanbul, Turkey, 27-29 Nov 2014.
5. Anas Alazzam , Ion Stiharu , Vahé Nerguizian , Saud Khashan , and Ahmad Bani Younes, Deregulated genes by separation of living cells using dielectrophoretic, 20th International Symposium on Separation Science, ISSS 2014, August 30- September 2, 2014. Prague, Czech Republic.
6. Anas Alazzam , Ion Stiharu and Saud Khashan, Continuous separation of cancer cells from blood in a microfluidic channel using Dielectrophoresis, Proceedings of ASME 2014 International Mechanical Engineering congress and Exposition IMECE2014 November 14-20, 2014, Montreal, Quebec, CANADA
7. Mohammed O. Hamdan and **Saud Khashan**, Numerical Investigation of Solar Chimney Power Plant in UAE. The 3rd “International Conference on Renewable Energy: Generation and Applications” ICREGA'14, March 2014, Al-Ain, UAE.
8. **Saud A. Khashan** and Yousef Haik , Numerical Simulation of Biomagnetic Fluid Separation In a 2D Planner Channel , Proceedings of the 11th International Conference on Fluid Control, Measurements and Visualization FLUCOME 2011, Keelung, Taiwan, December 5-9, 2011.
9. **Saud A. Khashan** and Edward Furlani, CFD-Based, Lagrangian-Eulerian coupling approach for Magnetophoretic Particle Capture, P-42, Proceedings of the 3rd Micro and Nano Flows Conference Thessaloniki, Greece, 22-24 August 2011.
10. **Saud A. Khashan** and Edward Furlani, Discrete Particle Modeling for Magnetophoretic Particle Capture, 3rd International conference of Nanotechnology, UAE-Al-Ain, 27-30 November, 2011.
11. Emad Elnajjar, Yousef Haik, Mohammed Hamdan and **Saud A. Khashan**, Experimental Study of Convective Heat Transfer of MWCNT in Aqueous Fluid Flow inside Micro-circular Tube, 3rd International conference of Nanotechnology, ICN2011, UAE-AlAin, 27-30 November, 2011.
12. **Saud A. Khashan**, Yousef Haik. and Emad Elnajjar, Magnetophoresis and Diffusion Interactions involving the Transport of Magnetic Microparticles, 7th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics HEFAT2010, Antalya, Turkey, July 2010.
13. M.A. Haggag, S.K. Elmasry, and **S.A. Khashan**, Integrating Intelligent Glass Facades for Low-Energy Building Performance: Design Criteria for Abu Dhabi, International Conference on Renewable Energy: Generation and Applications, ICREGA'10, Paper 232, Al-Ain, UAE, March, 2010.
14. Mohammad M., **Khashan S.**, Elnajjar E.,” Numerical Investigation of Dimpled Surfaces to Enhance Energy Recovery and Heat Transfer” The 10th Annual U.A.E. University Research Conference, April, 2009.
15. **S. A. Khashan** and Y. Haik, Numerical Simulation of Bio-magnetic Fluid Using a Simplified Equilibrium-Based Model. Paper 72:00, Proceedings of the 13th International Heat Transfer, Sydney Australia, 13-18 August, 2006.
16. Elnajjar E., **Khashan S.**, Mohammad M., Acoustic Excitation of instability waves in free Shear Layer of an Axi-Symmetric Cylinder, The Tenth Annual U.A.E. University Research Conference, April, pp. 841-849, 2009.
17. Y Haik, H Hejase, **S Khashan**, V Mohite, Magnetic Nanoparticles for Self-Controlled Hyperthermia, The Seventh Annual UAE University Research Conference, April 2006.
18. **S. A Khashan**, Effect of local thermal non-equilibrium in forced convection of non-Newtonian fluids through porous media. Paper HT-FED2004-56649, pp. 1145-1151, Proc. 2004 ASME Heat Transfer/Fluid Engineering Summer Conference, Charlotte, North Carolina, 2004.

19. **S. Khashan** and A. Alteraifi. Code Development and Validation of RANS solvers for Flows around Bluff Bodies. ASME Fluids Engineering, FED. Vol. 258, pp. 765-772. 2002. Paper IMECE2002-34157 presented at the ASME International Mechanical Engineering Congress & Exposition. New Orleans, Louisiana, November 17-22, 2002,
20. D. Ogbe, **S. Khashan**, Don Morton and Jun Liu, Performance Issues in Large-Scale Reservoir Simulation Using Parallel Processors, SPE 76745, SPE Western Regional/AAPG Pacific Section Joint Meeting, Anchorage, Alaska, May, 2002.
21. **S. Khashan**, D. Ogbe and T.Jiang: Development of Parallel code for large-Scale Petroleum Reservoir Simulation, Paper CIM-2000-41, Proc. Petroleum Society's International Petroleum Conference, Calgary, Alberta, June 4-8, 2000.
22. D. Ogbe, T. Jiang, **S. Khashan**, A. Lawel, Data and Computations Distribution for Large Scale Reservoir Simulation on massively Parallel Processors, Final report, National Science Foundation NSF, Advanced Computational Research Program, Project No. ASC-9720237, Nov. 2001.

Research Grants:

1. An Automated Microfluidic Platform for Cell Analysis, UAEU Start-up research fund, Fund no. 31N158, **495,000 AED**, granted Jan 2014
2. On-chip microfluidic system for multi-target cell separation and sorting. **PI**, NRF, Fund no. 31N130, 360,000 AED, granted on March 2013.
3. A novel micro device for separation of rare cells from blood using traveling surface acoustic waves (TSAW) and dielectrophoresis (DEP)", Khalifa University Internal Research Fund (KUIRF) level 2, External Investigator (**co-PI**); 3,000,000 AED over two years, Sep 2013- Dec 2015
4. Eulerian-Lagrangian model-based Predictions of Particulate Two-Phase Flows in Biomagnetic Separation Applications, **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no.1655-07-07-01-11, AED 20,000, awarded on Feb, 2011
5. Numerical and Experimental investigation for Magneto-convection heat transfer in channels and enclosures, **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 1655-07-07-01-10, AED 20,000, granted on march 2010 and completed on 2011.
6. Integrating Advanced Facades into High Performance Buildings: Intelligent Design Criteria for the UAE, **co-PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 06-06-7-11/08, AED 20,000, awarded on Feb, 2009.
7. Experimental and Numerical Simulation of Biomagnetic Fluid Dynamics, **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 06-06-7-11/06, AED 20,000, granted 2007 completed Feb, 2008
8. Color Particle Image Velocimetry, **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 06-06-7-11/05, AED 20,000, granted 2006 and completed Feb, 2007
9. Numerical Analysis of Conjugated Heat transfer slip flows in micro-channels. **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 06-05-7-11/05, AED 16,500, completed April, 2006.
10. Magnetic Hypothermia for Cancer Treatment, **co-PI**, Interdisciplinary Research Project no. 01-05-7-12/04, UAE, AED 256,000. Awarded on Dec 2004.
11. Optimization of Built-Form Configuration in Tall Buildings Using CFD Simulation to Improve Airflow and Promote Passive Cooling in Urban Environments in the UAE. Interdisciplinary Research Project no. 01-02-1-12/05, UAE, AED 200,000. Award pending final external reviewing.
12. Examination of the Local Thermal Equilibrium Assumption in Convective Heat Transfer in Non-Newtonian Fluids-Saturated Porous Medium, **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 06-05-7-11/04, AED 4,200, completed on April, 2004.

13. A Conservative Interpolation Scheme for Finite-Volume, Pressure-Correction-Based Methods in Collocated Grid. **PI**, Individual Research Funded by the Research Affairs Department, UAEU, project no. 05-05-7-11/03, AED 9500, completed on April 2003.
14. Investigation the flow & thermal behavior inside a pot-line building ventilation system. **co-PI**, consultation and research project externally funded through Efors by DUBAL, Dubai, UAE, AED 98,377. Awarded on Oct 2003
15. Code Development and Validation of RANS solvers for Flows Around Bluff Bodies, externally funded project by Dassault Aviation- France, Project No. 99/52-7-03, AED 199,000. Completed on October 2002.
16. Data and Computations Distribution for Large Scale Reservoir Simulation on massively Parallel Processors, **co.PI**, funded by National Science Foundation NSF, Advanced Computational Research Program, Project No. ASC-9720237, US\$124,000, completed on Nov 2001.
17. Super-Computation accounts; T3E Cray account granted from the DoD super computer center at the University of Alaska Fairbanks, and SP2 IBM account granted from the San Diego super computer center. Jan 1999- Sep 2000.
18. T3D Cray account, granted from Pittsburgh super computer center. Jan 1997 – Feb 1999.
19. Full scholarship and Teaching Fellowship from The University of Pittsburgh during my graduate study.

Other Research-Related Activities

- UAEU College of Engineering Research committee.
- Organizing committee for the World Congress and Expo Nanotechnology and Material Science, Dubai, UAE, April 13-15, 2015
- Organizing committee for the 2nd International Conference on Renewable Energy: Generation and Applications, ICREGA'10, Al-Ain, UAE, March, 2011.
- Organizing committee International Conference on Renewable Energy: Generation and Applications, ICREGA'10, Al-Ain, UAE, March, 2010.
- Editorial board member, Open Mechanical Engineering Journal (OME), BENTHAM Science Publishers.
- Executive editorial board for Emirates Journal for Engineering Research EJER, 2005-2006.
- Organizing committee for the International Conference on the Applications of Micro-Nano technology in Bio-technology: Future Prospects in the Emirates, UAE, Nov. 2006.
- Scientific committee for the International conference on Engineering theory and applications, Al-Ain, UAE, Jan. 2006.
- College scientific research committee.
- Reviewer for many International Journals of Microfluidics and Nanofluidics, Physics of Fluids, Journal of Engineering Mechanics: (ASCE), Engineering Science, Canadian Journal of Chemical Engineering, International Journal of Energy Research, International Journal of Exergy, Journal of Porous Media, Journal of Magnetism and Magnetic Materials, Kuwait Journal of Science and Engineering, international Journal of Applied Engineering Research (IJAER) and for many international conferences

CFD software:

Expert in FLUENT, COSMOL, CFX, Fidap, Airpack, Icepack, PolyFlow, FlowWizard and in modeling complicated geometrical designs, such as turbomachinery, using Gambit, CAD and GridGen.

Programming:

Expert in Fortran, Visual Basics, C, C++, Unix scripts and Parallel processing using PVM, MPI and utilizing cluster of workstation, T3E and SP2 supercomputers.

Honors, awards:

- **UAEU Award for Distinguished Merits; Excellence in Teaching, Research and Service, 2006.**
- Post-Doctoral Fellowship, National Science Foundation and School of Mineral Engineering, University of Alaska Fairbanks.
- Full MS and PhD Scholarships.