

## Mohamed Al-Fandi, Ph.D.

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### Degrees with fields, institution, and date:

- 1/01 to 12/04: University of Arkansas, **Ph.D.**, Microelectronics-Photonics Program (Multidisciplinary program),  
*Dissertation title:* Evaluation of *E. coli* Rotary Motors as Actuators for Microfluidic Systems.
- 2002: University of Arkansas, Certificate in Electronics Manufacturing, Electrical Engineering.
- 8/98 to 10/00: University of Arkansas, **M.S.**, Mechanical Engineering,  
*Research Area:* Investigated NO<sub>x</sub> emissions from premixed natural gas combustion.
- 9/90 to 5/95: Jordan University of Science & Technology, Jordan, **B.S.**, Mechanical Engineering

### Years of Service on JUST:

- 9/16 to 8/20: Founding dean of the Nanotechnology Institute at Jordan University of Science and Technology, Jordan University of Science and Technology, Irbid, Jordan
- Lead the team to develop a Master's program in Nano-science and engineering
  - Leading the research team of the Royal Hashemite Court innovative projects in nanotechnology with a total funding of (\$5,000,000)
  - Rapporteur of the steering committee for the Royal Initiative in Nanotechnology
  - Secured funding (Co-PI) from the Scientific Research Support Fund (SRSF) to support ICCNA-2018 conference (\$21,000)
  - Conference chair for the First International Conference on Current Nanotechnology and its Application (ICCNA-2018).
  - Served as a member in the course accreditation committee for the Nanotechnology Institute
  - Researching in Smart MEMS and Nanotechnology
  - Teaching graduate courses in Nano-engineering
  - Supervising graduate students
  - Establishing new laboratories for nano-fabrication and characterization
- 10/18 to present: Full professor, Mechanical Engineering and, Jordan University of Science and Technology, Irbid, Jordan
- 9/11 to 9/18: Associate professor, Mechanical Engineering and, Jordan University of Science and Technology, Irbid, Jordan
- Established the Micro and Nano systems Lab.
  - Micro and Nano systems Lab director.
  - Advised and co-advised many graduate and undergraduate students.
  - Teaching courses for undergraduate and graduate students
- 9/10 to 9/14: Founding director of the Nanotechnology Center at Jordan University of Science and Technology, Jordan University of Science and Technology, Irbid, Jordan
- Researching in MEMS and Nanotechnology with the focus smart micro/nano devices design, simulation, fabrication and characterization for a number of

applications including hybrid micro/nano-systems and particles (organic/inorganic), fluid dispensing, drug delivery and implantable devices.

- Lead the Jordanian team in TEMPUS project (PI-Jordan) “*Excellence in Nanoscience Education for MENA Region (XNEM)*” to develop a regional Master’s program in Nano-science and engineering along with 16 European and Arab partners. The total funding for this project is (1,400,000 Euro) 2014-2017.

9/06 to 9/11: Assistant professor, Mechanical Engineering and, Jordan University of Science and Technology, Irbid, Jordan

- Secured research funding (PI) of \$204,000 at JUST.
- Teaching courses for undergraduate and graduate students
- Spent summer 2008 at Lund Nanofabrication facility and worked with Prof. Tegenfeldt through ERASMUS MUNDUS mobility program on several research projects

#### **Other Related Experience-Teaching, Industrial, etc:**

8/05 to 9/06 Research Assistant Professor, Mechanical Engineering and Biomechanics, University of Texas, San Antonio, USA.

8/04 to 12/04: Senior Teaching Assistant, Mechanical Engineering Dept., University of Arkansas, Fayetteville, USA.

1/01 to 8/04: NSF IGERT Trainee, Microelectronics–Photonics Program, University of Arkansas, Fayetteville, USA

- Performed experimental and theoretical research on bio-micro-nanofluidic systems. Part of this research was the development of a multi-scale, multi-physics mathematical model in collaboration with CFD Research Corporation.
- Advised two students in research experience for undergraduates (REU) program funded by NSF.

5/02 to 7/02: CNF User, Cornell Nanofabrication Facility (CNF), Cornell University, Ithaca, USA.

- Used the following equipment to fabricate micro/nanochannels system: EBMF 10.5, RIE, DRIE, spin resist, pattern generator, EV 500 anodic bonding, EV620 backside and front side aligner, and wet etching (KOH).
- Attended the Nanocourse offered by CNF in summer 2002.

5/00 to 8/00: Mechanical Engineer Intern, Kawneer Company, Springdale, USA.

- Performed material strength analysis and mechanism design, prepared gas train drawing for ovens, and participated in building fluid metering system for solvents

8/98 to 12/01: Teaching Assistant, Mechanical Engineering Dept., University of Arkansas, Fayetteville.

7/97 to 3/98: Director for Mechanical Engineer Section, Kemasrunding Consultant, Malaysia

1/96 to 12/96: Research Assistant, Mechanical Engineering Dept., Malaysia National University, Malaysia

### Consulting, Patent, etc.:

- PI for international patent application has been filed under the number (4067-01WO1), 2016, entitled “*System and method for Providing Real-Time Visual Feedback to Control Multiple Autonomous Nano-Robots*”
- PI for patent pending entitled "*System and method for Providing Real-Time Visual Feedback to Control Multiple Autonomous Nano-Robots*" filed to the US Patent and registered trademarks office under the number 14/853236 dated Sep. 14th, 2015
- Mohammad Al-Rousan, Mohamedd Al-Fandi, Nizar Samarah “A Method for Enhancing Germination of Seeds using Carbon Nanoparticles”, patent from the Jordan Patent Office/ Ministry of Industry and Trade. 2021
- Served as a grant-reviewing panel for the National Science Foundation (NSF), USA, Nanomanufacturing solicitation
- Nanomedicine Journal reviewer
- Participated in the Mechanical Engineering department committees including secretary general of the council, scientific research committee, laboratories committee, workshops, conferences and electronic homepage committee and students’ affair committee.
- Participated in the JUST Nanotechnology center founding committee.
- Participated in organizing a Nanotechnology workshop with University of Torino, Italy.
- Participated in the Nanotechnology committees at the Jordan higher council for Science and Technology.
- Served as an evaluating member for the accreditation of the Mechanical Engineering department at the Applied Science University, Jordan (Jordan Higher Education Accreditation Commission).

### Publications:

1. Alsharedeh RH, Alshraiedeh NH, Masadeh MM, Alzoubi KH, **Al-Fandi MG**, Hayajneh RH, Atawneh FH, Shubair ZA, "Biofilm formation by E. coli and S. aureus on cellphone cover: sensitivity to commercially available sanitizers", *Pharmacia* 70(1): 181–186, 2023.
2. Mujahed I. Almomani, Yahia F. Makableh, **Mohamed Al-Fandi**, "Design and numerical simulation of a nanostructured ultraviolet shield for radiation protection applications using COMSOL", *Materials Today Communications*, Volume 33, 2022.
3. Nid'a H. Alshraiedeh, Omar F. Ammar, Majed M. Masadeh, Karem H. Alzoubi, **Mohamed G. Al-Fandi**, Rami J. Oweis, Rawan H. Alsharedeh, Rama A. Alabed and Rawan H. Hayajneh, "Comparative Study of Antibacterial Activity of Different ZnO Nanoparticles, Nanoflowers, and Nanoflakes", *Current Nanoscience* 18(1): 758-765, 2022.

4. T Harahsheh, YF Makableh, I Rawashdeh, **M Al-Fandi**, “Enhanced aptasensor performance for targeted HER2 breast cancer detection by using screen-printed electrodes modified with Au nanoparticles”, *Biomedical Microdevices* 23 (4), 1-11, 2021.
5. Muhamad Ali K Shakhathreh, Omar F Al-Rawi, Samer F Swedan, Karem H Alzoubi, Omar F Khabour, **Mohamed Al-Fandi**, “Biosynthesis of silver nanoparticles from *Citrobacter freundii* as antibiofilm agents with their cytotoxic effects on human cells”, *Current Pharmaceutical Biotechnology*, 22(9), pp. 1254–1263, 2021.
6. Rawashdeh1, I., **Al-Fandi, M.G.**, Makableh, Y., Harahsha, T., “Developing a nano-biosensor for early detection of pancreatic cancer”, *Sensor Review*, 41(1), pp. 93–100, 2021.
7. Al-Shami, A., Oweis, R.J., **Al-Fandi, M.G.**, “Developing an electrochemical immunosensor for early diagnosis of hepatocellular carcinoma”, *Sensor Review*, 41(2), pp. 125–134, 2021.
8. Makableh, Y.F., **Al-Fandi, M.**, Jaradat, H., Al-Shami, Rawashdeh, I., Harahsha, T., “Electrochemical characterization of nanosurface-modified screen-printed electrodes by using a source measure unit”, *Bulletin of Materials Science*, 43(1), 240, 2020.
9. Aljaioussi, G., Makableh, Y.F., **Al-Fandi, M.**, “Design and optimization of nanostructured UV-filters for efficient and stable perovskite solar cells”, *Semiconductor Science and Technology*, 34(12), 125014, 2019.
10. Al-Nemrawi, N.K., Marques, J., Tavares, C.J., Oweis, R.J., **Al-Fandi, M.G.**, “Synthesis and characterization of photocatalytic polyurethane and poly(methyl methacrylate) microcapsules for the controlled release of methotrexate”, *Drug Development and Industrial Pharmacy*, 44(12), pp. 2083–2088, 2018.
11. **Mohamed Al-Fandi**, Yahia Makableh, Mohammad Khasawneh, Rabi Rabadi, “Near Zero Reflection by Nanostructured Anti-reflection Coating Design for Si Substrates”, *Superlattices and Microstructure*, Vol. 117, pp. 115-120, 2018.
12. Rabi Rabady, **Mohamed Al-Fandi**, Mohammad Khasawneh, Abeer Andrawes and Yahia Makableh, “Profile Absorber Design Illuminated Uniformly by Parabolic Reflector”, *Applied Optics*, Vol. 57, No. 10, pp. 2441-2445, 2018.
13. **Mohamed Al-Fandi**, Nida Alshraideh, Rami Owies, Rawan Hayajneh, Iman Alhamd, Rama Alabed, Omar AlRawi, “Direct electrochemical bacterial sensor using ZnO nanorods disposable electrode”, *Sensor Review*, 2018. <https://doi.org/10.1108/SR-06-2017-0117>.
14. Khaled Saoud, Rola Al Soubaihi, Shaukat Saeed, Nasr Bensalah, **Mohamed Al-Fandi**, Tejvir Singh, “Heterogeneous Ag and ZnO based photocatalytic for waste water treatment under different irradiation conditions”, *Journal of Materials and Environmental Science*, vol. 9, No. 2, pp. 400-413, 2018.
15. **Mohamed Al-Fandi**, Nida Alshraideh, Rami Owies, Hala Alshdaifat, Omamah Al-Mahaseneh, Khadijah, “Novel Selective Detection Method of Tumor Angiogenesis Factors Using Living Nano-Robots”, *Sensors*, vol. 17, pp. 1580-1589, 2017.
16. **M. Al-Fandi**, R. Oweis, B. A. Albiss T. AlZoubi, M-Ali Al-Akhras, H. Qutaish, H. Khwailah, S. Al-Hattami, and E. Al-Shawwa, “A prototype Ultraviolet Light Sensor based on ZnO Nanoparticles/Graphene Oxide Nanocomposite Using Low Temperature Hydrothermal Method”,

International Conference on Advanced Materials (ICAM 2015), IOP Conf. Series: Materials Science and Engineering 92, 2015.

17. Mohammad A. Jaradat, **Mohamed Al-Fandi**, Omar Alkhatib and Yousef Sarda, "Intelligent control of miniature holonomic vertical take-off and landing robot", *Journal of Intelligent & Fuzzy Systems*, vol. 29, No. 3, pp. 1209-1217, 2015.
18. M. Jaradat, **M. Al-Fandi** and M. Nasir, "Automatic control for a miniature manipulator based on 3D vision servo of soft objects", *Mechatronics*, Vol. 22, Pp. 468-480, 2012.
19. **M. Al-Fandi**, M. Jaradat, M. Al-Rousan, L. Al-Ebbini and S. Jaradat, "*Flagellated Bacteria as Self-Navigator Nano/Bio-Robots*", *Journal of Mechanics in Medicine and Biology*, Vol. 12, No. 2, 1240003, 2012.
20. **Al-Fandi, M.** (Speaker), Jaradat, M.A. and Sardahi, Y., "*Optimal PID-Fuzzy Logic Controller for type I diabetic patients*", 8<sup>th</sup> International Symposium on Mechatronics and its Applications (ISMA 2012), Sharjah, UAE, 10-12 April 2012.
21. **M. Al-Fandi**, M. Jaradat and Y. Sardahi, "Optimal PI-fuzzy Logic Controller of Glucose Concentration using Genetic Algorithm", *International Journal of Knowledge-based and Intelligent Engineering Systems* Vol 15, pp. 99-117, 2011.
22. **M. Al-Fandi** (speaker, session chair), M. Jaradat, M. Al-Rousan and S. Jaradat, "*A Living Biological Nanorobot as Self-Navigator Sensor for Diseases*", the first Middle East Conference on Biomedical Engineering (MECBME'11), Sharjah, UAE, Feb. 22-25, 2011
23. N. Khasawneh, M. Jaradat, L. Fraiwan and **M. Al-Fandi**, "Adaptive Neuro-Fuzzy Inference System for Automatic Sleep Multistage Level Scoring Employing EEG, EOG, and EMG Extracted Features", *Applied Artificial Intelligence An International Journal*, Vol 25, pp. 163-179, 2011.
24. **M. Al-Fandi**, M. Al-Rousan, M. Jaradat and L. Al-Ebbini "New Design for the Separation of Microorganisms Using Microfluidic Deterministic Lateral Displacement," *Robotics and Computer-Integrated Manufacturing Journal*, Vol 27, pp. 237-244, 2011.
25. **M. Al-Fandi**, M. Jaradat, A. Abusaif and T.C. Yih, "A Real Time Vision Feedback System for Automation of a Nano-Assembly Manipulator inside Scanning Electron Microscope", 7<sup>th</sup> International Multi-Conference on Systems, Signals and Devices, Jordan, June 27-30, 2010
26. **M. Al-Fandi**, M. Jaradat, K. Fandi, J. Beech, J. Tegenfeldt and T.C. Yih, "Nano-Engineered Living Bacterial Motors for Active Microfluidic Mixing," *IET Nanobiotechnology*, Vol. 4, No. 3, pp. 61-71, 2010.
27. M. Jaradat, **M. Al-Fandi** (speaker, session chair) and T. C. Yih, "A Prototype Vision-Servo System for Automation of a Nano-Assembly Workstation", First Annual Conference in Nanotechnology, August 17, 2008, Rochester, MI.
28. **M. Al-Fandi**, M. Al-Rousan, M. Jaradat and K. Al-Zoubi, "*Nano Engineered Biological Rotary Motors as Ready-to-Use Devices: Integration Challenges, Simulations and Opportunities*", Knowledge Based Industries and Nanotechnology Conference, February 11-12, 2008, Doha, Qatar.

29. T. C. Yih and **M. Al-Fandi**, "Engineered Nanoparticles as Precise Drug Delivery Systems," *Journal of Cellular Biochemistry*, Vol. 97, pp. 1184-1190, 2006.
30. **M. Al-Fandi**, J.W. Kim, S. Tung, A. Malshe, J. Jenkins and R. Pooran, "Chemo-Sensitivity and Reliability of Flagellar Rotary Motor in a MEMS Microfluidic Actuation System," *Sensors and Actuators B*, Vol. 114, pp. 229-238, 2006.
31. R. Pooran, **M. Al-Fandi**, S. Tung and J.W. Kim, "Patterning of *Escherichia Coli* Flagellar Motors in a Microfluidic System," International Conference on Bio-Nano-Informatics Fusion, 2005, Marina Del Ray, CA, 2005.
32. R. Pooran, **M. Al-Fandi**, J.W. Kim, S. Tung and J.S. Lee, "Bacterial Flagellar Motors as Microfluidic Actuators," ASME International Mechanical Engineering Congress and Exposition (IMECE), November 13-19, 2004, Anaheim, CA.
33. J.W. Kim, S. Tung, J.S. Lee, N. Kotagiri, R. Pooran and **M. Al-Fandi**, "A Hybrid Flagellar Motor/MEMS Micro-Pump," 96th AIChE Annual Meeting, November 7-12, 2004, Austin, TX.
34. **M. Al-Fandi** (speaker), A. Malshe, J. Jenkins, S. Tung, J.W. Kim, and R. Pooran, "*E. coli* Cell Motors for MEMS Devices: Fabrication and Modeling," First International Workshop on Nano & Bio-Electronics Packaging, March 22-23, 2004, Atlanta, GA.
35. **M. Al-Fandi** (speaker), A. Malshe, S. Sundaram, J. Jenkins, S. Tung, and J.W. Kim, "Simulation and Design an *E. coli*-Based Rotary Micropump for Use in Microfluidic Systems: Integration of Micro-Nano-Bio," ASME International Mechanical Engineering Congress and Exposition (IMECE), November 15-21, 2003, Washington, D.C.

**Scientific and Professional Societies (Previous membership):**

- International Microelectronics and Packing Society (IMAPS)
- American Society of Mechanical Engineers (ASME).
- Society of Automotive Engineers (SAE).
- Jordan Engineers Association, Professional Engineer membership

**Scholarships, Honors, Prizes, Awards & Juries:**

- 2014, 2017: Serving as an award and grant reviewer for the Abdul Hameed Shoman Foundation, in the Nanotechnology field.
- 2014: Served as a proposals grant reviewer for the Scientific Research Support Fund (SRSF), Jordan
- 2013: TEMPUS fund to establish Regional Master's program in Nano-science and Engineering
- 2013: Qatar Annual Research conference "ARC13" Health research Posters award
- 2005/2004: Served as a grant-reviewing panel for the National Science Foundation (NSF), USA, Nanomanufacturing solicitation.
- 2008: Nanomedicine Journal reviewer.
- 2008: Erasmus Mundus award as a visiting research faculty, Sweden.
- 2001: IGERT Trainee National Science Foundation at *University of Arkansas*.
- 1995: Second rank among 62 students who were graduated in the same class at *Jordan University of Science & Technology*.

1995: Dean's Honors list at *Jordan University of Science & Technology*.

**Institutional and Professional Services:**

- Served as a member in the JUST University committee for the establishment of central Labs
- Founding dean for the Nanotechnology Institute
- Chair for the Research Committee at the mechanical engineering department, JUST.
- Participated in the Mechanical Engineering department committees including secretary general of the council, scientific research committee, laboratories committee, workshops, conferences and electronic homepage committee and students' affair committee.
- Participated in the JUST Nanotechnology center founding committee.
- Participated in organizing a Nanotechnology workshop with University of Torino, Italy.
- Participated in the Nanotechnology committees at the Jordan higher council for Science and Technology.

**Professional Development Activities:**

Attended the following workshops:

- Modern Teaching Strategy
- Modern University Instructional Methods
- E-Learning Open Education Resources
- Testing and Evaluation
- Equipment operation and servicing: AFM, ESEM, Optical Tweezers