

# **Basem Fayez Yousef, Ph.D, P.Eng. (Canadian)**

United Arab Emirates University- Department of Mechanical Engineering

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## **Education**

The University of Western Ontario, Canada

**Jan 2003 – July 2007**

### **Ph.D. – Engineering Science - (Robotics)**

Thesis title: *Design of a Robot Manipulator and an Ultrasound Probe Holder for Medical Applications.*

Advisors: Rajni Patel and Mehrdad Moallem

Details: Designed a novel robotic manipulator and an ultrasound probe holder for prostate brachytherapy procedures (high-precision performance). The project involved designing the robots from scratch, 3D CAD modeling and animations, stress and dynamic load analysis, electromechanical components selection, prototype machining and building, performance simulations, developing calibration strategies and control algorithms, and designing and carrying out experimental test procedures.

The University of Western Ontario, Canada

**Jan 2000 – Jan 2002**

### **Master of Engineering Science (M.E.Sc) – Mechanical and Materials Engineering**

Thesis title: *Neural network approach to modeling the laser material-removal process*

Advisor: George Knopf

The University of Jordan, Jordan

**Jan 1993**

### **Bachelor of Science (B.Sc) – Mechanical Engineering**

## **Specialty Qualifications and Licenses Held**

- Licensed by the Professional Engineers Ontario (PEO) as a professional engineer (**P.Eng.**) in the province of Ontario-Canada.
- (June 1999) Licensed by *Autodesk* as a certified **AutoCAD qualified trainer** for basic and advanced levels.
- (1999) Appointed as a member of the committee responsible for revising and developing Mechanical Engineering Drawing textbook for the technical education in the United Arab Emirates.

## **Awards, Honors, Fellowships, Scholarships:**

- (2006) Ontario Graduate Scholarship in Science and Technology, OGSST: a prestigious provincial scholarship in the province of Ontario in Canada
- (2005) Ontario Graduate Scholarship (OGS): a prestigious provincial scholarship in the province of Ontario in Canada
- (2003) Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship (PGS-B, two years): a prestigious national scholarship in Canada
- (2003) Ontario Graduate Scholarship (OGS)

## **Professional Experience**

United Arab Emirates University, Al Ain, UAE

**Sept. 2014- Present**

**Associate Professor in the Department of Mechanical Engineering**

United Arab Emirates University, Al Ain, UAE

**August 2008- August 2014**

**Assistant Professor in the Department of Mechanical Engineering**

- Teaching and developing undergraduate courses and graduate courses as assigned
- Conducting research in the areas of Robotics (specifically surgical robots for Minimally invasive surgery), Smart Mechatronics systems, Autonomous vehicles, Control, and Mechanical Design.
- Member on several departmental and college committees

**MAKO Surgical Corp., FL., USA**

**Nov. 2007 – July 2007**

**Robotics System Engineer**

- Design and conduct experiments for performance and reliability testing of medical robotic systems
- Diagnose failures, perform root cause analysis, and suggest design improvements
- Develop formal test protocols for design verification, reliability and manufacturing at subassembly and system level
- Work on cross-functional team with mechanical, electrical, and robotic engineers to develop testing protocols and complex electromechanical test equipment.

**The University of Western Ontario**

**July 2007 – Nov. 2007**

**Postdoctoral Research Fellow**

- Conducting research on robot-assisted surgery, kinematics, robot design; and developing medical robotic devices for use in minimally invasive therapy.
- Robotic system hardware/software integration.
- Calibration optimization techniques.

**The University of Western Ontario**

**Jan. 2003 – June 2007**

**Teaching and Research Assistant**

- Supervised students in Embedded and Real-Time Control Systems lab
- Lecturer in ProEngineer R.2002 for the engineering students
- Supervised and guided students in multi-disciplinary engineering design projects (such as designing disaster shelters and energy generation techniques)
- Supervised and assisted students in SolidWorks labs
- Supervised Feedback Control Systems lab

**The University of Western Ontario**

**Apr 2002 – Aug 2002**

**Research Assistant**

- Responsible for the *Virtual Reality* and *3D laser-scanning* lab

**The University of Western Ontario**

**Jan 2000 – Jan 2002**

**Teaching and Research Assistant**

- *Mechatronic system design*: guided and helped students to design and build autonomous walking robots which were self-controlled with a controller preloaded on a microchip
- *Robotics and Automation*: supervised and assisted students in building a PLC and robot controlled production line
- *Engineering Graphics*: supervised and assisted students to produce assembly drawings and 3D models using AutoCAD and Unigraphics Solid Edge

**National Research Council of Canada**

**May 2000 – June 2001**

**Visiting Worker**

- Conducted research on material removal during the laser micro-machining process. My duties included: analyzing test specimens, collecting measurements using special nano-microscopes, analyzing and processing data for use in a neural network model that I developed to simulate the laser micro-machining process.

**Water & Electricity Department, Abu-Dhabi**

**1995-Dec 1999**

**Instructor**

- Lectured in Mechanical Engineering Drawing and AutoCAD for mechanical and electrical engineering students

**Al Suwaidi Engineering Consultants, Abu-Dhabi**

**1995 – Dec. 1999**

**Mechanical Engineer**

- Provided technical support for computer graphics applications (AutoCAD and Adobe photopaint).
- Prepare perspective views of residential buildings using 3D Studio Max
- Prepared spreadsheets for monitoring the work progress of the different projects, and the workload spent on each project by the individuals in different departments.

**Al-Khawarazmi International College, Abu-Dhabi**

**1995 – Dec. 1999**

**Computer Graphics Instructor**

- Trained employees of oil/gas industry companies such as ADCO, ZADCO and ADWEA on 2D/3D AutoCAD and 3D-Studio MAX

**The University of Jordan, Amman, Jordan**

**1993-1995**

**Lecturer**

Lectured for the engineering students in the following courses:

- Descriptive Geometry
- Engineering Drawing
- AutoCAD (2D/3D)

## **Contributions to Teaching and Education (In UAEU since 9/2008)**

### **Courses taught / developed:**

- Undergraduate courses:
  - **Developed** and taught *Selected Topics in Mechatronics* (Robotics)
  - **Developed** and taught “introduction to Robotics”
  - Introduction to Engineering Design & Ethics
  - Geometric Modeling (and **developed** course manual)
  - Dynamic Systems and Control
  - System Dynamics Lab
  - Differential Equations & Engineering Applications (and course **Coordinator**)
  - Senior Design Project I Supervisor
  - Senior Design Project II Supervisor
  - Master Seminar Coordinator
  - GP I coordinator
- Graduate courses
  - Currently **developing** and teaching “Advanced Robotics and Vibrations”
  - Ph.D. Seminar coordinator

### **Supervision of MS/Ph.D students:**

- Currently I’m supervising two Master students in Mechanical Engineering Department.

### **National and International Competitions:**

- Supervised students for an international competition sponsored by *Schulmberger* to design an *oil pipe inspection robot* (2009). Contestants from UAE University, and Japan [Tokyou Tech] competed against another team from USA [Rice University] and France [Paris Centrale, Supelec]. The team won the 1<sup>st</sup> place.
- Supervised teams of students from the UAEU to participate in the Engineering Students Ethics Competition 2013 (ESEC2013), 2011 (ESEC2011) and 2010 (ESEC2010) held at KUSTAR’s Abu Dhabi campus. The team won the **1<sup>st</sup> place for three years**.
- Organized and supervised 3D modeling Competition sponsored by ASME/UAEU chapter for the mechanical Engineering students (Spring 2010 and Fall 2010)
- Currently supervising and training a team of students to participate in the Engineering Students Ethics Competition 2013 (ESEC2013)
- Represent the UAEU and lead the effort of participating in the 2<sup>nd</sup> Unmanned Systems Rodeo (USR) to be held Fall 2013 in Dubai

### **Continuous Education Seminars/ Training Courses:**

- Given a Mechanical Workshop Training course for employees in STRATA (Jan.1- April 18 2013)
- Given a presentation for the ME seminar entitled as “Artificial intelligence and applications”, Fall 2012.
- Presented to MSc students about research areas in robotics and Artificial intelligence., Fall 2012.
- A Seminar for MEMS students, lecture title “Engineering design process”- March 2013.
- Through the Robotics club, I arranged for a workshop on Micro controllers to 25 students in ME, EE and IT, Spring 2013
- Supervised a workshop on Microcontroller for the Mechanical Engineering Students, UAEU Robotics club. April 24, 2012.
- Presented a seminar entitled “Innovative Design and Creativity”, New York University, Abu Dhabi Campus, Feb. 9, 2012
- Selected by the college to deliver a seminar on Product Design Specifications, UAEU, March 2011
- Seminar entitled “Design of a Robot Manipulator and an Ultrasound Probe Holder for Medical Applications”, in the Department of Mechanical Engineering at the UAEU, Oct 19, 2008.
- Seminar entitled “Design of a Macro Robot manipulator for Medical Applications” given in the Department of Mechanical Engineering at the University of Jordan, July 2006.

**Research grants**

| Grant Title                                                                       | PI/Co-PI | Total/Annual Funding | Start date | Status/Completion             |
|-----------------------------------------------------------------------------------|----------|----------------------|------------|-------------------------------|
| Pipeline Inspection Robot                                                         | PI       | 20,000 AED           | March 2010 | Completed                     |
| Design of a Compact Robotic Manipulator for Surgical Tools (Phase I)              | PI       | 30,000 AED           | March 2011 | Completed                     |
| Pre-Calibrated Portable Mechanism for Position and Orientation Tracking (Phase I) | PI       | 30,000 AED           | May 2012   | Approved (will commence soon) |

**Committee Membership****1. Departmental**

- **Robotics club director (Currently)**
- **Director of 3D modeling competition (2 Cycles)**
- Head of Machine shop committee
- Head of Control and Dynamics focus group committee.
- Teaching load committee member
- ME research committee member
- Scheduling committee member
- Member of the Continuous Quality improvement (CQI) committee
- ME GP committee revising the GP proposals
- A focus group committee member for the Manufacturing and Design.
- Act as a reviewer for research proposals submitted for project funding.
- Committee member for Mechatronics as a minor for ME and EE.
- Served Facilities committee member
- Publicity and Newsletter (committee member)
- Resource Diversification committee member
- Community outreach service committee member
- A member of the examination committees for the student final examinations of graduation projects
- A member of the examination committees for the industrial field training
- Academic advisor for undergraduate students.
- Academic supervisor of students in Industrial Training program
- Served on interview panels for new-hires in the ME dept.

**2. College**

- Prepared Rubric sheets for GPI and GPII evaluations in the College of Engineering.
- Member in the committee that revised the rubrics for GP final exam presentation.
- CATIA lab supervisor.
- Member on the panel of judges of the research committee for externally funded research proposals and presentations submitted to the COE (Feb.2013)
- Committee member: represented the UAEU visit to ADAT (Monday 18 march 2013) in preparation of a collaboration MOU.
- College representative for Industrial Training presentations.
- College representative for Graduation project examination committee.

**On the Organizing committee/ conference and workshop attendance/ exhibition participation**

- Participated in "UAE Innovations" of TAKAMUL program conference in Abu Dhabi- Sunday 10th March 2013.
- Participated as an exhibitor in the International Defense Exhibition and Conference IDEX2011, Abu Dhabi, UAE, 2011
- Completed SIX-SIGMA workshop organized by the Department of Mechanical Engineering at the UAEU between Dec.30-Jan 6, 2010
- Organizing committee member for the Symposium on Engineering Education (SEE09), UAEU, 2009
- Attended the International Conference on Renewable Energy: Generation and Applications - ICREGA'10 held in the UAE University, 2010.
- Attended the *motion and Mechatronics technology* day held in the American University of Sharjah (AUS) organized by the MSC institute of Technology- 15 Oct. 2009
- Attended the 2<sup>nd</sup> international conference on Nanotechnology, Nov. 2008, Abu Dhabi, UAE.

## **Publications**

### **Patents**

- 1) **Basem F. Yousef** "A Manipulator for Surgical Tools" United States Patent, **pending** (filed to the USPTO April 17, 2013).
- 2) **Basem F. Yousef**, "A Manipulator for Surgical Tools" United States Provisional Patent application # 61625960, filing date:18-April-2012.
- 3) **Basem F. Yousef**, Nabil Bastaki, "In-pipe inspection robot" United States Provisional Patent application # 61577020, filing date:17-DEC-2011.
- 4) **Yousef, Basem F.**, Patel, Rajni V., and Moallem Mehrdad, "Robot Manipulator for use in Medical Applications", University of Western Ontario Technology ID ROI- 06-019, United States Provisional Patent (# 60/845,262). Application filed Sept. 2006.

### **Books**

**Basem Fayez Yousef** "Design of a Robot Manipulator and an Ultrasound Probe Holder for Medical Applications", Canadian thesis, University of Western Ontario, Canada, 2007, 176 pages, ISBN 0494431121, 9780494431122

[http://books.google.ca/books/about/Design\\_of\\_a\\_Robot\\_Manipulator\\_and\\_an\\_Ult.html?id=bryAAr\\_e-HsC&redir\\_esc=y](http://books.google.ca/books/about/Design_of_a_Robot_Manipulator_and_an_Ult.html?id=bryAAr_e-HsC&redir_esc=y)

### **Articles in peer-reviewed journals and Book Chapters**

- 5) **Basem F. Yousef** and Nabil Bastaki, (2014), "Worm Robot with Dynamic Adaptation to Pipe Diameter for In-Pipe Inspection", International Journal of Engineering and Innovative Technology (IJEIT), 3(10), pp. 286-292.
  - 6) Ali Hilal-Alnaqbi; Abdel-Hamid I. Mourad; **Basem F. Yousef** (2014), "Effect of membranes on oxygen transfer rate and consumption within a newly developed three-compartment bioartificial liver device: Advanced experimental and theoretical studies", Biotechnology and Applied Biochemistry, 61(3), pp 304-315.
  - 7) Ali Hilal-Alnaqbi; Abdel-Hamid I. Mourad; **Basem F. Yousef**; John D.S. Gaylor, (2013) "Experimental evaluation and theoretical modeling of oxygen transfer rate for the newly developed hollow fiber bioreactor with three compartments", Bio-Medical Materials and Engineering, 23(5), pp 387-403.
  - 8) **Basem F. Yousef**; Abdel-Hamid I. Mourad; Ali Hilal-Alnaqbi, (2013), "Modeling of the mechanical behavior of polyethylene/polypropylene blends using artificial neural networks", International Journal of Advanced Manufacturing Technology, 64(5-8), pp. 601-611.
  - 9) **Yousef, Basem F.**, A Robot for Surgery: Design, Control and Testing, (2012) book chapter in "Advances in Robotics and Virtual Reality", Springer "Intelligent Systems Reference Library series", , vol. 26, Part I, pp. 33-59.
  - 10) **Basem F. Yousef**; Abdel-Hamid I. Mourad; Ali Hilal-Alnaqbi (2011), "Prediction of the mechanical properties of PE/PP blends using artificial neural networks", Procedia Engineering, 10, pp. 2713-2718.
  - 11) Hilal-Alnaqbi, Ali, **Yousuf, Basem**, and Gaylor J.D.S, (2011), "Fiber in Fiber (FIF) bioartificial liver device: initial design and prototyping", *Journal of Computer-Aided Design and Applications*, vol. 8, No. 1, pp99-109.
  - 12) **Yousef, Basem F.**, Patel, Rajni V., and Moallem Mehrdad, (Dec. 2010), "A Manipulator for Medical Applications: Design and Control", *ASME Journal of Medical Devices* - vol.4, No. 4, Dec.2010, (10 pages.)
- \*\*Listed on the top 10 most downloaded articles from ASME digital library - J. of Med. Devices. from Oct.2010- present, twice as the top 1<sup>st</sup>.**
- 13) **Yousef, Basem F.**, Patel, Rajni V. and Moallem Mehrdad, (Apr., 2008) "An Ultrasound Probe Holder for Image-Guided Robot-Assisted Prostate Brachytherapy", *Journal of Medical Devices* vol. 2, No 2, (7 pages).
- \*\*Listed on the top 10 most downloaded articles from ASME digital library J. of Med. Devices., for May 2008.**
- 14) **Yousef, Basem F.**, Knopf, George K., Bordatchev, E.V., and Nikumb, S.K., (2003), "Neural network modeling and analysis of laser material removal process during laser machining", *The International Journal of Advanced Manufacturing Technology*, Springer-Verlag London Limited, vol. 22, No. 1-2, pp.41-53.

### **Peer-reviewed conference proceedings:**

- 1) **Basem F. Yousef**, Invited speaker , ADCO 1st Mechanical Conference, "Worm Robot with Dynamic Adaptation to Pipe Diameter for In-Pipe Inspection" March 5th 2014, Abu Dhabi, UAE.
- 2) **Yousef, Basem F.** and Farah Aiash, "A Mechanism for Surgical Tool Manipulation", 9th IEEE Asian Control Conference (ASCC 2013) Accepted for June 23-26 in Istanbul turkey.
- 3) **Yousef, Basem F.**, et al. "In-Pipe Inspection robot", 15<sup>th</sup> International Conference on Climbing and Walking Robots (CLAWAR), Johns Hopkins University, Maryland, USA, July 2012.
- 4) **Yousef, Basem F.**, Abdel-Hamid I. Mourad and Ali Hilal-Alnaqbi, (June 2011) "Prediction of the Mechanical Properties of PE/PP Blends Using Artificial Neural Networks", 11<sup>th</sup> Int. Conference on the Mechanical Behavior of Materials (ICM11). Vol. 10, pp. 2719-2724, available online: <http://www.sciencedirect.com/science/article/pii/S1877705811006400>

- 5) Alnaqbi, Ali, **Yousuf, Basem**, and gaylor J.D.,(2010) "Fiber in Fiber (FIF) bioartificial liver device: initial design and prototyping", *International CAD Conference and Exhibition*, Dubai, UAE.
- 6) **Yousef, Basem F.**, Patel, Rajni V., and Moallem Mehrdad, (April 2007), "Ultrasound Probe Holder for Image-Guided Robot-Assisted Prostate Brachytherapy", *IEEE International Conference on Robotics and Automation (ICRA'07)*, pp. 232-237.
- 7) **Yousef, Basem F.**, Patel, Rajni V., and Moallem Mehrdad, (Oct., 2006), "Macro-Robot Manipulator for Medical Applications", *IEEE International Conference on Systems, Man and Cybernetics*, pp. 530-535.
- 8) **Yousef, B.F.**, Knopf, G.K., Bordatchev, E.V. and Nikumb, S.K. (2002) "Neural network approach to modeling the laser micro-machining process", *SPIE Opto-Canada*, vol. TRD01, pp. 193 - 195.
- 9) **Yousef, B.F.**, Knopf, G.K., Bordatchev, E.V., and Nikumb, S.K., (2001), "Neural network model of laser material-removal process", *Sensors and Controls for Intelligent Manufacturing II*, P. Orban (Ed.), *Proc. of SPIE*, vol. 4563, pp. 63 - 74. (12 pages).