# MONA E. ZAGHLOUL

**Ph.D., IEEE Life Fellow**

**NAI Fellow**

**October 2021**

**POSITION:** Professor, Department of Electrical and Computer Engineering

Director, Institute for MEMS/NEMS & VLSI Technologies ([http://mems.seas.gwu.edu](http://mems.seas.gwu.edu/) )

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**CITIZENSHIP: U**.S.A.

**EDUCATION:** Ph.D. Electrical Engineering, 1975

University of Waterloo, Waterloo, Ontario, Canada

M. Math. Applied Analysis and Computer Science, 1971

University of Waterloo, Waterloo, Ontario, Canada

M.A. Sc. Electrical Engineering, 1970

University of Waterloo, Waterloo, Ontario, Canada

B.Sc. Electrical Engineering, 1965

Cairo University, Cairo, Egypt

# PROFESSIONAL EXPERIENCE

**The George Washington University (01/1980-Present):**

**1980-Present** Professor (1989-present), Associate Professor (1983-1989), Assistant Professor (1980-1983) Department of Electrical and Computer Engineering, the George Washington University, Washington, DC.

**1996-Present** Director of the *Institute of MEMS and VLSI Technology*, the George Washington University, Washington DC. Chartered institute pioneering work on MEMS/NEMS and VLSI Devices.

**2014-2016** Program Director, IPA at Engineering Division: Electrical, Communications, and Cyber Systems, The National Science Foundation (NSF), supervising panels on MEMS/NEMS, Nano-sensors, Biosensors, and Nanotechnology, and involved in several Brain Initiatives at the national level.

**2009-2014** Chair, Department of Electrical and Computer Engineering, the George Washington University.

Under her leadership, the ECE Department was awarded 6-year ABET accreditation for the three programs of Electrical, Computer, and Biomedical Engineering. The Department hired several new faculty members in Biomedical, and Electrical Engineering, and several research initiatives were implemented, which resulted in an increase in the total research expenditure for the ECE Department.

**2003-2004** Sabbatical at the Army Research Laboratory (ARL), Adelphi, MD, working on MEMS Mechanical resonators, and RF-MEMS integration

**1999-2004** Member of the George Washington University Faculty Senate Committee.

**1999** Sabbatical with the Laboratory of Electronic Instrumentation at the Technical University of Delft, TU Delft, The Netherlands, working on sensors, devices, and their circuit interfaces.

**1994-998** Chair, Department of Electrical Engineering and Computer Science, the George Washington University. Under her leadership the EECS Department was awarded 6-year ABET accreditation for the programs of Electrical Engineering and Computer Engineering. The Department hired several new faculty members and several research initiatives were implemented, which resulted in an increase in the total research for the EECS Department.

**1988** Sabbatical with the National Institute of Standards and Technology (formerly the National Bureau of Standards), Gaithersburg, MD.

**1987** Summer Faculty, NASA/ASEE Goddard Space Flight Center, research activities included VLSI, analog circuit design and analysis (in particular the design of X-Ray detectors and particle detectors (analog MOS chips) on board of space ships).

**1984-2006** Faculty Hire, Guest Researcher at the Semiconductor Electronics Division,

National Institute of Standards and Technology (NIST), Gaithersburg, MD.

# Prior Positions (09/1968-01/1980):

**1978-1980** Senior Member of Technical Staff, Computer Sciences Corp., Silver Spring, MD. Research and development of software engineering systems and programming languages for NASA Goddard Space Flight Center.

**1977-1978** Research Associate, University of Waterloo, Waterloo, Ontario, Canada. Research in circuits and systems theory, computer aided analysis, and design of electronic circuits.

**1976-1977** Visiting Scientist, Aalborg University, Aalborg, Denmark. Research in computer aided analysis and design of electronic circuits.

**1968-1976** Research Assistant, University of Waterloo, Waterloo, Ontario, Canada. Research and teaching in electronic engineering, computer sciences, and Integrated circuits and systems theory and design.

# AWARDS, RECOGNITIONS, AND PROFESSIONAL ACTIVITIES

1. **Awards and Recognitions:**

**1)** **Elected National Academy of Inventors (NAI) Fellow, December 2017.**

**2) Certificate of Appreciation from the National Science Foundation, January 2017,** for serving as Program Director at the Division of Electrical, Communications and Cyber Systems (ECCS).

**3) BEST paper award for IEEE MWSCAS Conference, Myril Reed Award, August 2019.**

**4) First Prize, GWU Research and Development Show February 19, 2014**, for SEAS Graduate Students.

Graduate Student: Bhaven Mehta, Research Project**:** Highly sensitive gas sensor using plasmonic antennas, **Advisor:** Prof. Mona Zaghloul.

**5) Third Prize, GWU Research and Development Show February 19, 2014,** for SEAS Graduate Students. Graduate Student Hasan Goktas, Research Project: The novel resonator cell (RC) for both portable biosensor and high-quality filter for cell phones, **Advisor:** Prof. Mona Zaghloul.

**6) IEEE Life Fellow 2013, IEEE Fellow1996,** for leadership in education and research in Integrated Circuit design and their applications to Neural Networks.

**7) Second Prize, GWU School of Engineering Research Show Case, April 2012,** Graduate Student Ritu Bajpai Topic: UV-Assisted ZnO functionalized GaN nanowire devices for Chemical Gas Sensors. **Advisor:** Prof. Mona Zaghloul.

**8) Distinguished Research Award 2010**, School of Engineering and Applied Science, the George Washington University, Washington DC, AY 2010-2011.

**9) Best Paper Award by Department of the Navy**, **2010** Annual Research Publications Award paper title “Design and performance of simple, room temperature Gallium Oxide Nanowire Gas Sensor”, paper published in the Applied Physical Letters, 95,103102, 2009.

# 10) Elected IEEE Sensors Council President 2008-2009.

**11) Graduate Student Mazdak Taghioskoui received the following awards on the Micro-Plasma work**, Co-Supervisors: Mona Zaghloul and A. Montaser:

\* First-Prize Award for Washington Society of Engineers/Young Engineer Prize 2008 Paper Competition.

\* 2008 First-Prize Award for DCCEAS (District of Columbia Council of Engineering and Architectural Societies Paper Competition.

# 12) Honorary Doctor of Engineering, honoris causa, University of Waterloo, Canada, June 2007, recognition of academic career in the international electrical engineering community and in celebration of the University 50the anniversary.

# Dr. Zaghloul was the first woman to earn PhD in Engineering at University of Waterloo, Canada, in 1975.

**13) 2007 Best Paper Award in IEEE Sensors Journal**: I. Voiculoescu, M.E. Zaghloul, A. McGill, G. Fedder, “ Electrically Actuated Resonant Micro cantilever in CMOS Technology for Detection of Chemical Weapons” the *IEEE Sensors Journal, Special Issue on Sensors for Prevention of Terrorist Acts*, Vol. 5, No. 4, August 2005, pp. 641-647.

# 14) Recipient of the IEEE Circuits and Systems Jubilee Golden Medal For outstanding contribution to the IEEE Circuits and Systems Society, May 2000

**15) Distinguished Lecturer, IEEE Circuits and Systems Society**, 2000-2002.

# 16) Recipient – Certification of Appreciation from IEEE Circuits and Systems Society for Service as General Chair of the Midwest Symposium on Circuits and Systems 1992.

1. **Professional Activities:**

* Associate Editor for IEEE BIOCAS Journal 2016-Present.
* Arranged for Special Session” Beyond Silicon Computation”, IEEE International Symposium of Circuits and Systems (ISCAS), 2018, Florence Italy, May 2018.
* Arranged for Special Session “Brain Inspired Circuits and Systems”, IEEE International Symposium of Circuits and Systems (ISCAS), 2017, Baltimore MD, May 2017.
* President of the IEEE Sensors Council, two-years term, 2008, 2009, Past President of the IEEE Sensors Council 2010-2011.
* Member of the IEEE Fellow selection committee for the IEEE Sensors Council, 2009-2010. 2013-2014.
* Distinguished Lecturer in DLP for IEEE Sensors council, 2010-2012, 2018-2019.
* Member of the IEEE Sensors Conference Technical Program Committee, 2010-present.
* Member of the IEEE Midwest Symposium on Circuits and Systems steering Committee 1992-present.
* Associate Editor of the *IEEE Journal of Sensors*, 2000- 2007.
* Associate Editor of the *IEEE- Transactions on Circuits and Systems (CAS) I*, 2006-2007.
* Member, Fellow Committee for IEEE Circuits and Systems Society, 2007.
* Chair, Fellow Committee for IEEE Sensors Council 2005, 2006.
* Vice President for Technical Activities, IEEE Circuits and Systems Society, 2000-2002.
* Chair, IEEE-CAS Forum on Nanotechnology and Microsystems**,** May 23-24, 2004
* Member, IEEE Circuits and Systems Society Board of Governors, 1995-1998.
* Associate Editor of *IEEE Transactions on Circuits and Systems (CAS) II for Sensors*, 2000-2002.
* Editor of the *IEEE Circuits and Devices Magazine*, 1999-2000.
* Chair of the IEEE Circuits and Systems Society's Technical Committee of Neural Networks,
* 1998-1999.
* Founder Chair of the IEEE Circuits and Systems Society's Technical Committee on Micro-Sensors and Actuators, 1999-2000.
* Associate Editor, *IEEE Transactions on Circuits and Systems I for Neural Networks,* 1993-1995.
* General Chair, IEEE Midwest Symposium on Circuits and Systems, Washington, DC, August 1992.
* Member of the IEEE Midwest Symposium on Circuits and Systems Conference Steering Committee,
* and Microelectronic Education Conference Steering Committees.
* Reviewer – *IEEE Transactions on Circuits and Systems, IEEE CAS Special Issue on Neural Networks,*
* *IEEE Computer Magazine,* and *The Circuit and Systems and Signal Processing Journal, IEE Circuits Journal*, NRL, and NIH Technical Panels.

**3. Invited Talks:**

1. Invited for Talk on” Nanostructure for sensors for chemical and Biological Systems”, GWU-SEAS-Center for Women in Engineering, April 14, 2021.
2. Invited for Talk on “Women in Engineering: Global and Personal Perspectives”, Army Research Laboratory, March 27, 2018.
3. Invited for a Talk at the 14th U.S. –Korean Forum on Nano Technology, Sept.11-12, 2017, Westin Tyson Corner, Falls Church, VA, U.S.A. National Science Foundation, and South Korea sponsored the workshop. Professor Mona Zaghloul presented talk title is “2D Materials for Gas Sensing”.
4. Invited for talk about Chemical Gas sensing, to Pierre and Mary Curie School of Engineering, University of Paris, Paris France, February 2017. Professor Mona Zaghloul presented the talk. The Title of the talk is “Nano Structures Sensors for Chemical and Biological Systems”.
5. Invited for Distinguished Lecturer Series, Department of Electrical and Computer Engineering, Virginia Commonwealth University (VCU), April 26, 2016. Professor Mona Zaghloul presented the talk. The Title of the talk is “Nano Structures Sensors for Chemical and Biological Systems”.
6. Invited for Lectures on Chemical and Biosensors Design and their Nano-Implementation, to the Department Electrical Engineering and Computer Science Department, Colorado School of Mines, 310D Brown Building, 1610 Illinois Street Golden, CO 80401. August 5th, 2015.
7. Invited to be Keynote Speaker for SYLICA Workshop, Brno University of Technology, Czech Republic on October 16, 2014. The trip and the invitation were sponsored by Central European Institute of Technology CEITEC, a scientific center of excellence in the fields of life sciences, advanced materials and technologies. Professor Zaghloul visited the research facilities of CEITEC and toured the clean room and Nano and Micro research laboratories. The groups are working on bio and chemical sensors and there is considerable research overlap between Professor Zaghloul research and the CEITEC researchers. Talk Title: “Nanostructured Sensors for Chemical and Biological Systems”.
8. Invited to National Science Foundation to talk about Sensors/ MEMS-NEMS Research Activities, November 19, 2013.
9. Invited to European Space Agency (ESA) to talk about High Power GaN Circuits in Space Applications, September 2, 2013.
10. Invited to Special Session on Bio-Inspired Technology, IEEE MIDWEST Symposium on Circuits and System, August 2013.
11. M.E. Zaghloul, “Flexible Wearable Smart Sensors with Wireless Transmitting and Receiving Signals”, Army Research Labs, October 2012.
12. M.E. Zaghloul, “Nanotechnology Realizations of MEMS/NEMS Structures with Applications to Chemical and Bio Sensors”, talk to George Town University, November 2012.
13. M.E. Zaghloul Talk to TAU BETA PI, Engineering Honor Society, District 4 Conference, Keynote Speaker, Trends in Nanotechnology, April 16, 2011, The George Washington University, Washington DC.
14. M.E. Zaghloul, Talk to The National Nanotechnology Initiative Network (NNIN), Use of NNIN for fabrication of CMOS –SAW Integrated Devices, April 29the 2008, Stanford University, Palo Alto, CA.
15. M. E. Zaghloul Keynote Speaker at the University of Waterloo Graduation Ceremony and Celebration of the 50th year, June 16, 2007.
16. M.E. Zaghloul Presented talk at NSF workshop Tunis Titled “Micro Cantilever Gas Sensors“, Tunis, December 2006.
17. Invited to Plenary Lecture to the 2nd International Meeting on Micro sensors and Microsystems, National Cheng Kung University, Tainan, Taiwan, January 15-16, 2006.
18. Invited to the Institute for Computing, Information and Cognitive Systems ICICS, University of British Columbia, Vancouver, BC, Canada, Distinguished Lecture Series, Spring 2003, “Microelectromechanical Systems Technology”, March 27, 2003.
19. Member of the IEEE-CAS Distinguished Lecturer in the IEEE Distinguished Lecture Program, 2000-2002.
20. M.E. Zaghloul, “Overview of MEMS Technology with applications to RF Communication“, presented as IEE-CAS DLP, for Southeastern Michigan Section, Chapter I, March 27, 2002.
21. M.E. Zaghloul, “CMOS Implementation of Gas Sensors and their Circuits Interfaces”, Presented to the Department of Electrical and Computer Engineering, Oakland University, MI, March 2002.
22. M.E. Zaghloul, “Overview of MEMS Technology with applications to RF Communication”, Presented to the Department of Electrical and Computer Engineering, Virginia Tech, VA, April 2002.
23. M.E. Zaghloul, “MEMS, Microsystems and Nano-systems”, Plenary Keynote Speaker at the 7the International Workshop on Cellular Neural Networks and their Applications, Frankfurt, Germany, July 2002.
24. Presented Plenary talk “MEMS Structures and Sensors”, at the IEEE MIDWEST Symposium on Circuits and Systems, Dayton, Ohio, August 2001.

# Member of Technical Committees and Technical Reviewers Activities:

* 1. Member of the IEEE Gustav Robert Kirchhoff Award Committee for Year 2022-2023.
  2. IEEE Transaction of BIOCAS Associate Editor 2016-present.
  3. Member of IEEE Gustav Kirchhoff, Award Committee, 2021.
  4. Member of IEEE CASS Fellow Evaluation Committee 2019. 2018,2019,2020,2021.
  5. Reviewer member of European Funding agency H2020-FET-OPEN 2016-present.
  6. Reviewer for Research Funds for Natural Technology, Quebec Canada, 2016.
  7. IEEE Sensors Conference Member of the technical Committee for the years 2010, 2011, 2012, 2013, 2014, 2015. 2016, 2017,2018.
  8. IEEE Transaction of BIOCAS, reviewer 2014, 2015, 2016,2017,2018.
  9. IEEE Education Award Committee member, 2012, 2013.
  10. ECEDHA (ECE Department Head Association) member of award committee, 2011, 2012, 2013, 2014.
  11. National Science Foundation, Proposals Reviewer January 2012, May 2012.
  12. IEEE Transaction for Circuits and Systems Journal part I reviewer.
  13. IEEE Sensor Journal reviewer.
  14. IEEE Electron Device Letters reviewer.
  15. IEEE Microwave Wireless Components Journal reviewer.
  16. The National Children Hospital Proposals Panel reviewer.
  17. IEEE MIDWEST Symposium reviewer, Member of the technical Committee, and member of the steering Committee.
  18. IEEE International Symposium of Circuits and Systems (ISCAS), Member of the technical Committee 2012, 2013, 2014,2015,2016,2017,w018,2019,2020.

# Collaboration with National Laboratories

Design of testing structure circuits for GaAs circuits, SOI circuits. NIST , DOC.

Building wafers for reliability. Designing Microelectromechanical Systems (MEMS) for RF-MEMS and microfluidic MEMS. Micro-machining, techniques to develop CMOS sensors implementation and design their interface circuits, other technology for Sensors and Biosensors. Test Structures for Nanometer interconnects of VLSI chips. NIST, DIC.

**2006-Present**- Working on Joint projects with National Institute of Standards and Technology (NIST), which include Chemical Gas sensors using nanotechnology. Nanomaterial 2D material,

with applications to development of Nano-devices for future Nano-circuits and Nano-sensors applications, Biosensors development for COVID-19.

**2004-Present**-Working on Joint projects with Army Research laboratory, working on Nano-electronics, Phase Changing Materials (PCM), and design of electronics RF circuits for Army needs.

# RESEARCH ACTIVITIES

**Research Interests:**

Integrated Sensors and Nanodevices, process technology to realize MEMS/NEMS devices, novel designs of MEMS/NEMS devices and Nano-sensors, RF-MEMS and MEMS Sensors with applications to Biosensors, Biological and Chemical Sensors using Surface Acoustic Wave (SAW) devices and Micro/Nano sensors for Biomedical applications and Chemical Gas Sensors. Smart Sensors and their interface Integrated circuits, digital and analog CMOS Circuits design and analysis, Neural Circuits to study the Brain, Neuromorphic circuits.

GHz circuits design and their implementations; semiconductor devices, design and simulations.

Taught MEMS/NEMS courses at GWU for the past several years and worked with the industry on MEMS Sensors devices; familiar with the clean room micro-fabrication and Nano-fabrications process to realize MEMS/NEMS sensors, 2D materials applications for Nano electronics devices and Nano-sensors.

# Theses and Dissertations Supervised:

**Doctoral Dissertations Supervised at The George Washington University: Total 40 Theses**

1. M. Saidahmed, Analysis of Generalized State-Space for Singular Systems, April 1983.
2. N. Matta, Analysis and Design of Large-Scale Interconnected System, April 1985.
3. A. Said, Design of Switched Capacitor Filters, July 1985.
4. E. Konechny, Iterative Improvement in the Design of a Restricted Class of VLSI Macrocells, March 1986.
5. C. Aissi, Testing of Physical Failures in NMOS and CMOS VLSI Combinational and Sequential Circuits, July 1988.
6. Dessa Gobovic, New Physical Fault Simulator for VLSI CMOS Circuits, November 1988.
7. A. K. Elmusrati, Systolic Arrays for Solving Linear Time Invariant Singular Systems, October 1990.
8. F. 1. Hamama, Design of an Adaptive Neural Network, November 1990.
9. G. Moon, VLSI Design of Neural Networks Using Pulse Coded Weights with On Chip Learning Capability, March 1993.
10. H. Ali, CMOS Dynamic Retina with Associative Memory Capabilities, September 1993.
11. C. Hsu, Chaotic Neural Networks Analysis and Implementation, July 1995.
12. S. Habib, Continuous Time Neural Networks for System Identification and Control, July 1996
13. V. Milanovic, Broadband Microwave Power Sensor in CMOS Technology, December 1998.
14. P. Thaker, Register Transfer Level Fault-Modeling for VLSI Design Validation and Test, March 2000.
15. M. Ozgur, CMOS-Based Monolithic MEMS Technology and its Application in Microwave Systems, April 2000.
16. J. Wiley, Convex Hull Metrics and Neural Classifiers, April 2001.
17. Angela Rasmussen, Implementation and Modeling of Microfluidic Components realized Using CMOS Technology, May 2001.
18. Nadine Guillame, Non-Contact Electrical Metrology Sensor for Chrome Photo Masks, May 2002.
19. M. Afridi, Monolithic CMOS Gas Sensor with Interface Circuits, August 2002
20. Ioana Voiculesco, Design and Development of MEMS Devices for Detection of Hazardous materials, December 2004.
21. Arif Emre Yrimbock, Modeling, Simulation, and Measurements of Nano-Scale Copper thin Films, June 2007.
22. Onur Tigli, Novel SAW Devices in CMOS for Biosensor Applications: Design, Modeling, fabrication and Characterization, December 2007.
23. Anis Nordin, Design, Implementation and Characterization of Temperature Compensated SAW

Resonators in CMOS technology for RF Oscillators, January 2008.

1. Jerry C. Wu, Systematic Analysis of CMOS-MEMS Inductors with Application to Mixer Matching Circuits, November 2008.
2. Shumin Zhang, Design and Development of RF CMOS MEMS Switches for Configurable RF circuits, January 2009
3. S. Arnold, Silicon Nanometer wire for enhanced Gas Sensors in CMOS technology (with NRL), January 2010.
4. Thomas Farmer, Millimeter Wave High Voltage High Power Amplifier Implementation in Silicon Germanium Technology, April 2010.
5. Hsu-Cheng Ou, Design of the One –Pole Synchronous LINB3 Surface Acoustic Wave Resonator with Sensing Applications, April 2010.
6. Chia-Pin Chang, Design Development and Testing of Fluorescence-based Microfluidic System for Uric Acid Analysis of Clinical Samples, December 2010.
7. Robert Proie, Development of a Piezoelectric MEMS Switch Architecture for Low Power, Radiation Hardened and Highly Integrable Mechanical Logic, May 2011.
8. M. Taghioskoui, Design and Implementation of Microdevices for Plasma Generation, September 2011.
9. R. Bajpai, UV-Assisted GaN Nanowire Devices for Alcohol Sensing, May 2012.
10. Bowei Zhang, CMOS Biosensors for Portable Molecular Diagnostic System, August 2012.
11. Bhaven Mehta, Chemical Gas sensor based on Optical Nano antennas using Graphene, January 2015.
12. Hasan Goktas, Design, Fabrication and Characterization of CMOS-MEMS Novel Resonator with Embedded Heater for Filter, and Temperature Sensors Applications, January 2015.
13. Kevin Dobson, High Frequency Analog to Digital Converters with application to RF

Receiver/Transmitters, October 2015.

1. Shiqi Guo, TMDC-based soft and Wearable Bioelectronics Toward Precision Health Care, April 2019.
2. Asha Rani, MoTe2 for Electrical and Gas Sensing Properties with Applications to Chemical Gas Sensing, April 2019.
3. Boqun Dong, **“**Generation and Enhancement of Surface Acoustic Waves on Highly Doped P-type GaAs and its Photoelectric Applications”, September 20, 2019.
4. Yangyang Zhao, “Nanohole Array-Based Diverse Sensing System Towards Next

Generation Technology”, October 8th, 2019.

1. Ken McKnight , “Design and Analysis of Broadband Doherty Power Amplifiers”, November 21st, October 2019.
2. Libin Sun, “ Plasmonic Sensing Platform Design, simulations, Fabrication, and Optimization with application for Both Gas-phase and Liquid-phase Biosensing”, June 30th 2021.
3. Reza Karimian, “High Coverage Smart Antenna Design by Using Beam Switched and Non-Reciprocal Method”, July 19, 2021.

# Master's Theses Supervised at The George Washington University, Total 24 Theses.

1. D. Gobovic, Fault Diagnosis of Nonlinear Circuits, May 1985.
2. D. Rhee, Computer Simulation Studies of Photomultiplier, December 1986.
3. K. Benatchba, Algorithm for Testing Physical Failures in VLSI Digital Circuits, December 1989.
4. G. Moon, VLSI Implementation of Neural Type Cell, July 1990.
5. K. Shaffer, Implementation of a Neural Network Based Intelligent Controller Using VLSI Technology, March 1991.
6. R. Yentis, VLSI Implementation of a Cellular Neural Network for Solving Partial Differential

Equations, September 1994.

1. C. Zincke, Microelectromechanical Heating Element Structure Characterization and Control, October 1995.
2. V. Milanovic, Design and Fabrication of Micromachined Microwave Transmission Lines in CMOS Technology, November 1996.
3. S. Arnold, Hardware Implementation of Complex SAR Software Algorithm, Dec.2001.
4. A. Nurashikin Nordin, CMOS Design and Implementation of Sigma – Delta Analog –to- Digital Data converter for MEMS Devices, July 2002
5. Harry Shaw, MEMS Structures for Electrophoretic and Dielectrophretic Separation of Particles by Contactless electrodes, December 2005.
6. Y. Wu, Field Programming Gate Array (FPGA) Security and Reliability, December 2005.
7. A. Gupta, A 400 MHz Delta –Sigma ADC for Band-Pass IF Digitization Around 100MHz with Excess Loop Delay Compensation, August 2010.
8. Ken McKnight, 5GHz Doherty Amplifier Designed in Triquent GaAs Process, December 2010.
9. Scott Trocchia, A RF Graphene FET Large -Signal Compact Model Compatible with Circuit Simulators, June 2012.
10. Qiuchen Yuan, A high Resolution Time- to- Digital Converter on FPGA for Time Correlated Single Photon Counting, August 2012.
11. Boqun Dong, Modeling and Simulation of InAS/GaAs Quantum Dot Solar Cells in Silvaco TCAD, October 11, 2013.
12. William Gibbs, Design for Test for OSU Standard Cell Library Used at GWU, May 18, 2014.
13. Chris Reilly, MEMS Capacitor Sensing for Position Detection of Movable Objects, September 29, 2014.
14. Sina PourJabar, Design and simulation of Nano Plasmonic Biosensors, Sina PourJabar master thesis, 2 May 2016.
15. Allan Morales, Highly Sensitive Wearable Piezoelectric Force Sensor with Quasi –Static Load Testing, May,2017.
16. Libin Sun, High Frequency SAW Resonator, Design, Simulation, and Optimization with Application to chemical Gas Sensors. December 2017.
17. Jiale Li, Multi Sensor Platform Design for Indoor Gas Monitoring in Asthma Detection Application, December 2017.
18. Xinquan Jiang, A Low power Microheater for Thermal Control and Discrimination of Mixture Gases, May 2019.
19. Sheng Wang, Design, Simulation, and Measurement of Interface Electronics

For Wearable SAW Drug Delivery System, April 25.2020.

26. Zheng Sun, Electrical Transport Properties of N- and P- Doped InSe:

Bulk Crystals versus Exfoliated Layers, June 30, 2020.

27. You Zhou, Design and Simulation of Surface Acoustic Wave (SAW) -For Drug Delivery Device, June 2020.

28. Young Soung Park, “The Design of Bluetooth Communications Systems between a Battery-Less Implanted Sensor and Android Phone using a Wireless Power Transfer System”, June 2021.

# Dissertations in Progress:

1. Leo De La Cruz, Modeling and Application of Two-Phase materials in design of RF Switches devices (collaboration with the ARL).
2. You Zhou, Piezoelectric Materials Properties and Enhancement
3. Sezin Sayin Drug Delivery Using Nanotechnology for Neurological disorder.

**Teaching Activities**

**The GW VLSI and MEMS, and Nano-electronics Educational Programs, 1984-Present:**

Professor Zaghloul proposed and initiated the Integrated Circuits (IC) teaching programs at the George Washington University and is teaching several of the analog and digital IC design and testing courses. She established a well-equipped IC testing laboratory at the Department of Electrical and Computer Engineering at GW. She is responsible for the IC education software tools, upgrading testing equipment to accommodate IC design and testing courses in the Electrical and Computer Engineering. The laboratory was initiated by Professor Zaghloul to educate GWU students in designing and testing IC chips, and to send chips to MOSIS since 1984. As part of this program, several projects with teaching as well as research chips were designed and fabricated through the Silicon Foundary under her supervision. Successful analog and digital chips were designed and tested in the GW IC Laboratory as a part of this program. In addition, micro sensor chips were designed and implemented using the clean room facility at The George Washington University and testing the Devices at her Laboratory. The laboratory is equipped with commercial IC design CAD tools (CADENCE) as well as a testing facility that includes probing machines and analog and digital testing equipment, as well as testing for sensors, Biosensors, and Chemical Sensors. In the Fall of 1999, Professor Zaghloul taught the first MEMS/NEMS course at the George Washington University. Students learn the design and technology of MEMS /NEMS sensors devices. MEMS courses include design of sensors and wearable sensors. All the courses result in projects to be fabricated through facilities at GWU and through companies and national laboratories. Professor Zaghloul has strong connections with several national clean room facilities and National and International Foundries.

In Fall 2011, Dr. Zaghloul introduced new course on Nano-Electronics as graduate/ Undergraduate course. The course was designed under NSF grant on Nanotechnology for Undergraduate Education. The course have laboratory in which the students learn the basic nanofabrication process and learn techniques to characterize Nano-structures in the lab. In addition to teaching lectures of the theoretical fundamental of Nano-electronics and introduction of the students to recent research topics for nanomaterial with applications to development of Nano-devices for future Nano-circuits and Nano-sensors applications.

Professor Zaghloul supervises the Computer Tools and Design software for teaching the MEMS /NEMS classes at GWU. In the Spring 2018 Professor Zaghloul introduced Nano/Micro fabrication laboratory associated with MEMS/NEMS course and using the clean room facility at GWU. The Students in the laboratory learned basic design of MEMS/NEMS structure and build test device for measurement in the laboratory. In addition, many research projects were implemented using the IC and MEMS/NEMS design tools under the supervision of Dr. Zaghloul.

# Courses Taught and Introduced at GW:

Taught and introduced many courses at The George Washington University; more than 20 courses and course modifications such as: Basic Circuit Theory, Linear Systems, Nonlinear Circuits Theory, Neural Network Analysis and Design using CMOS technology, circuits to mimic the neuron, synapse and ANN.

Introduction to VLSI Design and Simulation, VLSI Fabrication Techniques, Testing and Simulation of VLSI Circuits tools, Linear Systems Theory, Graph Theory and Applications, Computer Aided Analysis and Design of VLSI System (using software such as Microsim, Verilog, CADENCE, Analog Artists, Tanner tools, and many other academic tools ), Design, Analog MOS VLSI Circuits for Signal Processing, Digital Filters, RF- Microwave Circuits Design using software such as EDS, CADENCE- Specter, Introduction to MEMS/NEMS Design and Applications (using MEMS CAD tools such as Coventor, and Ansys ). Introduced new area courses such as: Introduction to Nanotechnology, and Introduction to Nano electronics. The Following is a list of courses developed and taught at GWU:

# Graduate Courses Introduced and Taught:

1. ECE 6240 Introduction to VLSI Systems.
2. ECE 62145 Introduction to Nano/Micro Fabrication
3. ECE 6250 Testing and ASIC Design of VLSI Systems.
4. ECE 6260 Introduction to Nano electronics, 2D materials. Introduced Laboratory to use GWU-Nano-Fabrication Facility, imaging. Introduced THREE laboratories at ECE/SEAS associated with courses to use the Nano - Fab facility at SEAS. The students are trained on using the Micro/Nano machines and fabricate MEMS/NEMS MEMS/NEMS devices and Nano - Sensors.
5. ECE 6213 VLSI Circuits. Design using FPGA.
6. ECE 6214 Advanced VLSI System Designs and LOW POWER Design.
7. ECE 6215 Introduction to MEMS/NEMS. Introduced laboratory experiments to design and fabricate MEMS structures at the GWU Nanofabrication facility, started SPRING 2018.
8. ECE 6216 RF CMOS Circuits. CMOS design for RF applications
9. ECE6217 Neural Networks and their Hardware Implementations
10. ECE 6218 Introduction to Analog VLSI Design, Using CADENCE software for design of ADC and DAC and other important analog components.

# Undergraduate Courses Introduced and Taught:

1. ECE 2110 Circuit Theory.
2. ECE 2140 Design of Logic Systems- I.
3. ECE 3135 Design of Logic Systems-II.
4. ECE 4140 Introduction to VLSI Systems
5. ECE 4145 Introduction to Nano/Micro Fabrication with laboratory to use GWU nanofabrication facility.
6. ECE 4160 Introduction to Nano Electronics.

**NSF Activities as IPA January 1st, 2014-December 31st, 2016**

Professor M. Zaghloul joined the National Science Foundation from January 2014-December 2016 as IPA appointment in the Division of Electrical, Communications and Cyber Systems (ECCS). She managed the Program Circuits, Communications, and Sensors Systems (CCSS).

During her time as IPA she accomplished the following:

* 1. Selected Panel members for the assigned Unsolicited Proposals for 2014-2016. Attended and managed three panels for Unsolicited Proposals per year and recorded all the outcomes and discussion of the panels, selected the top awardee based on the panels’ discussions and recommendations, and managed all the documentations needed for each year for the total number of unsolicited proposals assigned to finalize the process.
  2. Worked on CAREER 2014-2016 proposals. Selected panel members for Career Proposals, set the panel and recorded all the outcomes and discussion of the panel, selected the top awardee based on the panels’ discussions and recommendations, and managed all the documentations needed for the total number of CAREER proposals during the IPA period, to finalize the process.
  3. Worked with several Divisions Initiatives at the NSF on the Brain Initiatives and was member of across the foundation divisions program Directors. Worked on the Brain Solicitation, and on planning the panels

(Three panels were running each year). Supervised Engineering Brain proposals. Worked with divisions Program directors on the decisions for funding for 2014, and 2016.

* 1. Joined the NSF Neuro Next - Next Generation Networks for Neuroscience- attended the meetings for planning the panels. My name appeared on the solicitation NSF 16-569 for 2016 and was part of the team for answering email requests from the community on regular basis. Worked with the Group to sort out the received LOI and identified the Engineering Topics.
  2. Worked with Dr. Michael Rocco to prepare and support Intelligent Cognitive Assistants workshop, May 12-13, 2016 CA. Worked on the workshop final report. The workshop final report was issued and is available.
  3. Worked with Dr. Michael Rocco to prepare and support the The 13the U.S. Korea Forum on Nanotechnology: Brain –Inspired Computing and Nano-Biomimetic for Energy & Water Sustainability.
  4. Worked with Dr. Usha Vashney to support NSF Workshop on Papertronics: Paper-based Electronics for the 21stCentury. Workshop was held September 12-14, 2016 in Arlington, VA. Final Report is available.
  5. Lead the site visit team for the Engineering Research Center ASSIST, managed the meeting and prepared the questions to the ASSIST team and planned the interaction between the NSF team and ASSIST team. Prepared the site visit report for ASSIST ERC. The site visit was on May 3-4, 2016.
  6. Prepared the Review Analysis for the ASSIST ERC (NSF Engineering Research Center on Health Sensors) and submitted the review analysis report for the ASSIST –ERC fourth year renewal. Prepared all the documents needed for the fourth-year renewal for the ASSIST Center in 2015.
  7. Arranged for REU requests for summer 2014, 2015, and 2016. Managed and approved R.E. U. requests for Principal Investigators.
  8. Involved in EAGER proposals discussions and funded several EAGER proposals, during 2015, 2016.
  9. Attended NSF Scalable Nano-Manufacturing (SNM) Program meetings and shared with group discussions and preparation for the solicitation 16-513. Arranged for the SNM panel 2015, and 2016, and prepared the proposals review analysis, and the awards for the highly recommended proposals. My name appeared on the Solicitation.

# FUNDED RESEARCH, PROPOSALS AND AWARDS at The George Washington University

1. "Mixed Integer Programming Techniques for the Solution of Worst‑Case Network Problems." The George Washington University, summer 1980, $1,500.
2. "Linear Programming Algorithms for the Worst‑Case Tolerance Optimization in Integrated Circuits." The George Washington University, 1981‑1982, $3,300.
3. "Tolerance Design and Model Simplification Integrated Circuits," The George Washington University, 1982‑1983, $3,000.
4. "Integrated Circuit Worst‑Case Tolerance Problems Modeling Using Linear Programming Algorithms." The Industrial Liaison Program, The George Washington University, Fall 1981, Fall 1982.
5. "Digital Computer Control Laboratory," Co‑Investigator, NSF, 1981‑1982, $17,885.
6. "Testability Analysis of Digital Integrated Circuits," National Bureau of Standards, Department of Commerce, Principal Investigator, 1985‑1986, $19,630.
7. "A Proposal for the Continuation of Pre‑Shuttle LIDAR System Research," NASA Langley Research Center, granted 1985‑1986, Co-principal investigator, 1986, $139,305.
8. "Computer Aids for Testing and Design of VLSI Circuits," The George Washington University, 1986, $4,500.
9. "Computer Assisted Engineering in Analog System Design," Martin Marietta Corp., Data Systems Division, 1987, $19,800.
10. "Liaison to Use MOSIS Fabrication Facilities for VLSI Class Projects," National Science Foundation, granted since 1985, 1985‑present, about $10,000 each year.
11. "VLSI Implementation of Neural‑Type Cell," National Science Foundation, Principal Investigator, 1988‑1990, $58,622.
12. "VLSI Implementation of Neural Type Circuits," National Science Foundation, Principal Investigator, 1990‑1992, $35,000.
13. "High Speed Functional Components VLSI Chips for Telemetry Data Capture Systems," Goddard Space Flight Center, NASA, 1990‑1991, $50,000.
14. NIST Graduate Research Fellowship, established in the Electrical Engineering and Computer Science Department at the George Washington University, under supervision of Dr. Zaghloul, "Research on Micro machined Electronic Devices," 1992‑1993, 1993-1994, 1994‑1995, 1995‑1996, 1996‑1997, 1997‑1998, $30,000 each year, Total $180,000.
15. "Development of Micro machined Power Sensors," RF Microsystems, Inc., 1994‑1995, 1995‑1996, each year $28,100, and for 1996‑1997, $36,000, Total $92,200.
16. NIST Graduate Research Fellowship, under supervision of Dr. Zaghloul, "Research on Microelectronic Test Structures Analysis and Techniques," 1996‑1997, $28,815.
17. GW Research Enhancement Funding for the Charter of the "Institute for MEMS and VLSI Technologies," 1996‑1999, $30,000 each year, Total $90,000.
18. "Development of Micro machined Microwave Sensors," RF Microsystems, Inc., for June 1997 ‑ May 1998 for $106,000.
19. "Development of Micro machined Power Sensors," Titan, for June 1998 ‑ May 1999, $130,000.
20. "MEMS Military Applications," Defense Advanced Research Projects Agency (DARPA), Principal Investigator, October 1998 ‑ December 2001, $453,000.
21. "Applying Modern Electronic Technology to Local Egyptian Electronics Industries, FRCU/Cairo University, October 1997 ‑ December 2001, $160,570.
22. NIST contract under supervision of Dr. Zaghloul, "Research on Testing Submicron Lithography Technology," September 1998 ‑ December 1999, $32,000.
23. NIST Fellowship for May 1999 ‑ April 2000, under supervision of Dr. Zaghloul, "Research for Developing Gas Sensors Using Micromachining CMOS Technology," $32,000.
24. GW Research Enhancement funding for chartered "Institute of MEMS and VLSI Technologies," 1999‑2001, three year for a total of about $100,000.
25. “RF-MEMS in CMOS Technology,” Space and Naval Warfare Systems Center, San Diego, December 1999 – November 2002, $272,291.
26. NIST Fellowship for January 2000 – December 2000, contract under supervision of Dr. Zaghloul, “Research on Testing Submicron Lithography Technology,” $33,805.
27. NIST Fellowship for May 2000 – April 2001, contract under supervision of Dr. Zaghloul, “Design and Analysis Tool for CMOS Micro machined Gas Sensors Structures,” $32,000.
28. Trident Systems Inc., Sept.2000- February 2001,” High Dynamic Range Digital Radar Implementation using FPGA technology”, Phase I of STTR with ONR $31,359.
29. The George Washington University: research enhancement funds, Institute of MEMS and VLSI Technology, Co-PI, $120,000, 2000-2002.
30. Trident Systems Inc., March2001- February 2004, “High Dynamic Range Digital Radar Implementation using FPGA/ASIC technology”, Phase II of STTR with ONR $170,000.
31. America Online, “Home of the 21st Century”, Co-PI, $167,000,2001-2002 $150,000,2002-2003.
32. Naval Research Laboratory, “Gas Sensor Pre-Concentrator”, Co-PI, $199,000, 2001-2003.
33. NIST, “Multi-Technology Systems on chip with Standard Testing”, $ 56,000, 2002-2003.
34. NIST, “Copper Interconnect for Deep submicron study”, $47,724, 2003-2004.
35. NIST, “Copper Interconnect for Deep submicron study”, $47,724, 2004-2005.
36. NASA, GSFC, “RF-MEMS Design and Implementation of RF-Switch”, $56,000, 2002-2003.
37. National Science Foundation, “CMOS Integrated Bio-Sensors Array Chip Using SAW Technology, $180,000, 2002-2006, with supplements.
38. National Security Agency (NSA), “Testing for FPGA Bit Error”, GMU/LUCITE-PI , $100,000, 2003-2004.
39. Trident Systems Inc., March 2004, “Continuation of Digital Radar FPGA implementation”, $30K, PI, March 2004-January2005.
40. Trident Systems Inc., March 2004, “Continuation of Digital Radar FPGA implementation”, $45K, PI, January 2005-December 2005.
41. NIST, “Characterization of Copper Conductivity in IC Processing”, $57,724, PI, Mrach2005-March 2006.
42. National Science Foundation,” Egypt-USA agreement for Design of SAW devices”, $28,925, PI, 2005-2007.
43. NIST,” Characterization of Copper Conductivity in IC Processing “, $34,500, PI, April2006-December 2006.
44. The George Washington University Facility Funds, “Realization of MEMS device for Chemical Spectroscopy”, with Professor A. Montaser, PI, $24,990. 2006-2007.
45. The George Washington University Research Funds, Office of the Chief of Research “Micro Plasma MEMS device for Chemical Analysis”, CO-PI with Professor A. Montaser, Student Support Stipend and Tuition, $60,000, 2007-2008.
46. The George Washington University Research Funds, Office of the Chief of Research, “Biosensor Development using CMOS technology” $15K to support Post Doc Onur Tigli for 6 Months, PI, May –October 2008.
47. The George Washington University Research Funds, Office of the chief Research, “developing Uric Acid Detector”, $9.5K to support student C. Chen, July 2008-May 2009, PI, (co advising with D. Nagel).
48. National Science Foundation, NSF,” Nano Undergraduate Engineering at The George Washington University (NUE@GWU)”, Co-PI, $200K, 09/01.09- 08/31/11.
49. The George Washington University facilitating fund/Diltheyan Competition, Micro plasma for Environmental and Biomedical Applications, PI, for $11,794, July 2010-June 2011.
50. The George Washington University, Research Enhancement Funds, Micro plasma Devices, with Professor A. Montaser, GWU Chemistry Department, PI, $55K, July 2010- June 2012.
51. Proposal submitted to the DoD 2010, SBIR Phase I, Topic N101-056, “Compact, Low Cost, MEMS Hotplate Sensors for Analysis of Battery off Gassing”, with Alpha Sense, Inc., PI, **Awarded** for $21K June 2010-Januray2011.
52. Proposal “Miniaturized Biosensor for Fast Screening of infant Patients serostatus or Genotype using small volume (<50uL) heel prick whole blood samples”, Co-PI GWU /Children Hospital, October 2010, with Professor Zhenyu Li, Awarded $30K. January 2011-2012.
53. Proposal “Designing and Implementation of miniature Cantilever for detecting Toxic in Blood”, ARL, Awarded, July- 2012, November 30, 2013, PI, $15K
54. Proposal to Virginia Dominion Company, “Photovoltaic Enhancement using Quantum Dots”, Awarded March 2013- August 2016, Co-PI, $150K
55. Proposal to European Space Agency, through Euroconsult, “Study of Applications of MEMS/NEMS and GaN Devices in Satellite Communications”, Awarded March 2013-November 30, 2013,PI, $33K.
56. A Wireless Wearable Electrocardiogram (ECG) Sensor on a Finger Ring, Awarded, June 2015- June 2016, The Center for Innovative Technology (CIT), VA, 2015. Co-PI, $200K. The award requires matching funds of $100K, $100K matching GWU. Total award is $200K.
57. Ambulatory Sensor Arrays for Real-Life Monitoring of Pediatric Patients with Asthma, Awarded NIH, total Budget $2,229,250. Collaboration with Children Hospital, Dr. Dinesh Pillai (SMHS/CNMC). Submitted to NIH, Co-PI, Awarded, October 2015- September 2020.
58. IPA with the National Science Foundation (NSF), Program Director of Communications, Circuits, Sensors Systems Program, Engineering Directorate, $ 289,825 NSF direct funding, $51,147 cost sharing, Total $350,200, 03/25/2016 -03/24/2017. **Total NSF Support as IPA Award Funding Amount: $922,273.00.**
59. SBIR from DoE (PI) in collaboration with Muon, Inc.**, STTR Phase I,** Design and Implementation of Electronics Cathode using Surface Acoustic Wave (SAW).PI, $45,160.00. Sept. 2017-June 2018.
60. Funds from Muon, Inc., $ 10,000 to support Student for July 2018, and August 2019.
61. Funding from GWU Technology Commercialization Office (TCO) for study of diagnosis and identifying COVID-19, PI, $50K July1st ,2020 to December 31st, 2020.
62. National Science Foundation, Proposal on “Enhancement of Piezoelectric Properties in two- dimensional materials and its application”. $150k, PI, August 1st, 2020 to July 31st, 2022.
63. Funds from Hoth Therapeutic Company, New York , to work on developing COVID-19 testingdevice using patented Nano-whole device. The work is in collaboration of GWU Public Health School Dr. Jeanne Jordan, Dr. Zaghloul is the PI on the work. **Total funds $500K,** September 2020-July 31st 2021.

TOTAL Funding to The George Washington University is about **$8,376,716.** Funds are obtained from varieties of agencies such as NSF, NIST, DOE, DARPA, NIH, NASA, Commercial Companies, and University resources.

# PUBLICATIONS AND PATENTS

**Books:**

* + 1. *“Silicon Implementation of Pulse Coded Neural Networks,”* co-editor, M. E. Zaghloul, J. Meador and R. W. Newcomb, Kluwer Academic Books, 1994.
    2. *“Design and Testing Guides for the CMOS and Lateral bipolar-on SOI test Library”;* National Institute of Standard and Technology, Washington, 1994.
    3. “*Nano cantilever Beams: Modeling, Fabrication and Applications*”, Ioana Voiculescu, and Mona Zaghloul (Editors), Pan Stanford Publishing, ISBN978-981-4613-23-1, 2016.

# Book Chapters:

1. "Physical Fault Modeling and Simulation of VLSI MOS Circuits," Chapter 1 in *“VLSI Fault Modeling and Testing Techniques,”* G. W. Zobrist, editor, Ablex Publishing Corp., Norwood, NJ, 1993.
2. "Design of Pulse Coded Neural Networks with Learning on the Chip and Using Modified Neural Type Cells," Chapter 7 in “*Silicon Implementation of Pulse Coded Neural Networks,”* M. E. Zaghloul, J. Meador, and R. W. Newcomb, editors, Kluwer Academic Books, 1994.
3. "Chaotic Neural Network Architecture," with C. Hsu and H. Szu, Chapter 7 in “*Handbook of Neural Network and Fuzzy Logic*,” C. C. Chen, editor, McGraw-Hill, 1996.
4. “Applications of Microelectromechanical Systems”, with D. Nagel, Chapter 2 in *“The Electrical Engineering Handbook*,” Wai-Kai Chen, editor, Academic Press, 2003.
5. “MEMS Designs and Applications, an Introduction”, Chapter 10 in *“Mechanical Engineering Handbook,”* Myer Kutz, editor, Wiley publishing, 2005.
6. “Integrated Chemical Sensors”, with Ioana Voiculucu, Chapter 11 in *“Chemical Sensors, Comprehensive Sensor Technologies,”* GhenadII Korotcenkov, editor, Publisher, Momentum Press, 2011.
7. Dobson K, Ahmadi S., Zaghloul M.,” A480 MHZ band-pass Sigma delta analog to digital modulator with active inductor-based resonators”, Chapter 1 in Lecture Notes in Electrical Engineering, 247 LNEE, pp. 1-11, DOI: 10.1007/978-94-007-6818-5-1. Springer Science, 2014, pp1-11, Chapter 1.
8. Ritu Bajpai, Mona Zaghloul, Abhishek Motayd, Albert Davydov, “Nanocantilever beam for gas sensing applications”, Chapter 5, Applications of Nano cantilever in Gas Sensors, “Nano cantilever Beams: Modeling, Fabrication and Applications”, Ioana Voiculescu, and Mona Zaghloul (Editors), Pan Stanford Publishing, Singapore, 2016.
9. M.E. Zaghloul, “ Integrated Circuits, MEMS, and Nanoelectronics for Sensors Applications”; Chapter 9 in the Book “ Women in Microelectronics”; ISBN: 978-3-030- 46893-4, Alice Parker and Leda Lunardi, (editors), Springer Nature publisher, July 2020.

# Journal Special Issues Co-Edited:

1. IEEE Sensors Journal, Special Issue on “Integrated Multisensory Systems and Signal Processing,” Volume 2, Number 6, December 2002.
2. IEEE Transaction on Very Large-Scale Integration (VLSI) Systems, Special Issue on “Nano Electronic Circuits and Systems,” Volume 12, Number 11, November 2004.
3. IEEE Transactions on Circuits and Systems, Special Issue on “Smart Sensors,” Volume 54, Number 1, January 2007.

# Refereed Journals Papers:

1. M. E. Zaghloul and P. R. Bryant, "Error Bounds on Solution Errors of Nonlinear Networks when Using Approximate Element Characteristics," *IEEE Transactions on Circuits and Systems,* Jan. 1980, CAS-27.
2. M. E. Zaghloul and W. Truszkowski, "Semantic Definitions of Spacecraft Command and Control Languages Using Hierarchical Graphs," *AIAA Journal of Guidance and Control,* Jan. /Feb. 1983, pp. 26-32.
3. M. E. Zaghloul, "Linear Programming Technique to Determine Solution Errors in Piecewise Linear Resistive Networks," *AEU, Electronics and Communication,* April 1983, pp. 85-92.
4. M. E. Zaghloul, "Worst Case Analysis of Resistive Networks Using Linear Programming Approach," *The Franklin Institute Journal,* Oct. 1983, pp. 339-351.
5. M. E. Zaghloul and R. Newcomb, "Semi state Implementation: Differentiator Example," *Circuits, Systems, and Signal Processing Journal, Special Issue on Semi state Systems,* 1986, 5(1), pp. 171-183.
6. M. E. Zaghloul and N. Matta, "Near Optimum Design Scheme of Linear Time Invariant Large-Scale Systems," *The AIAA Journal of Guidance and Control,* May/June 1986, pp. 374-376.
7. A. Said and M. E. Zaghloul, "Stray-Free Switched Capacitor General Biquad Block," *IEE Proceedings-G Electronic Circuit and Systems,* June 1986, 133, Part G (3), pp. 154-158.
8. M. E. Zaghloul and D. Gobovic, "Single Fault Diagnosis of Nonlinear Resistive Networks," *IEE Proceedings-G Electronic Circuit and Systems,* Feb. 1987, 134, Part G (1), pp. 16-22.
9. M. E. Zaghloul, "Testability Measures for the Design of Digital ICs," *VLSI System Design,* Sept. 1987, pp. 98-108.
10. A. Said and M. E. Zaghloul, "Stray Free Switched Capacitor Loop Biquad that Realizes Different Generic Transfer Functions," *Journal of the Franklin Institute,* 1989, 26(2), pp. 273-279.
11. M. E. Zaghloul, D. Khera, C. Reeve, and L. Linholm, "Machine Learning Approach to Classify Test Structure Data of Lithography Manufacturing Process," *IEEE Transactions on Semiconductor Manufacturing,* May 1989, 2(2), pp. 47-53. D. Rhee and M. E. Zaghloul, "Computer Aided Simulation Study of Photomultiplier Tubes," *IEEE Transactions on Electron Devices,* Sept. 1989, 36(9), pp. 205-210.
12. G. Moon, M. E. Zaghloul, and R. W. Newcomb, “An Enhancement-Mode MOS Voltage Controlled Linear Resistor with Large Dynamic Range”, IEEE Transactions on Circuits and systems, Oct. 1990, *CAS 37(12), pp.1284-1288.*
13. M. E. Zaghloul and D. Gobovic, "Fault Modeling of Physical Failures in CMOS VLSI Circuits," *IEEE Transactions on Circuits and Systems,* Dec. 1990, CAS 37(12), pp. 1528-1543.
14. M. E. Zaghloul and D. Gobovic, "Fault Simulation of VLSI CMOS Circuits," *IEE Journal on Computers and Systems, Proceedings-E,* July 1991, 138(4), pp. 203 -212.
15. G. Moon, M. E. Zaghloul, and R. W. Newcomb, "VLSI Implementation of Synaptic Weights and Summation in Pulse Coded Neural-Type Cells," *IEEE Transactions on Neural Networks,* May 1992, 3(3), pp. 394-403.
16. J. Marshall, M. Parameswaran, M. E. Zaghloul, and M. Gaitan, "Methodology for the Computer Aided Design of Micro machine Devices in a Standard CMOS Process," *IEEE Circuits and Devices,* Nov. 1992, 8(6).
17. H. Szu, C. Hsu, P. Thaker, and M. Zaghloul, "Image Wavelet Transforms Implemented by Discrete Wavelet Chips," *Journal of Optical Engineering,* July 1994, 33(7), pp. 2310-2325.
18. V. Milanovic, M. E. Zaghloul, "Improved Masking Algorithms for Chaotic Communication," Electronic Letters, Jan. 1996, 32(1), pp. 11-12.
19. R. Yentis and M. E. Zaghloul, "VLSI Implementation of a Cellular Neural Network for Solving Partial Differential Equations," *IEEE Transactions on Circuits and Systems,* 43(8), Aug. 1996, pp. 687-690.
20. V. Milanovic. M. Gaitan, E. Bowen, and M. E. Zaghloul, "Micro machined Coplanar Waveguides in CMOS Technology," *IEEE Transactions on Microwave and Guided Wave Letters,* 6(10), Oct. 1996, pp. 380-382.
21. C. Hsu, D. Gobovic, M. E. Zaghloul, and H. Szu, "Chaotic Neuron Models and Their Circuit Implementation," *IEEE Transactions on Neural Networks,* 7(6), Nov. 1996, pp. 1339-1350.
22. V. Milanovic, M. Gaitan, J. Marshall, and M. E. Zaghloul, "CMOS Foundry Implementations of Shottky Diodes for RF Detection," *IEEE Transactions on Electron Devices,* 43(12), Dec. 1996, pp. 2210-2214.
23. V. Milanovic and M. E. Zaghloul, "Synchronization of Chaotic Neural Networks and Applications to Communications," *International Journal of Bifurcations and Chaos in Applied Sciences and Engineering*, 7(1), Jan. 1997, pp. 2571-2585*.*
24. V. Milanovic, K. Syed, and M. E. Zaghloul, "Combating Noise and other Channel Distortions in Chaotic Communications," *International Journal of Bifurcations and Chaos in Applied Sciences and Engineering*, 7(2), Feb. 1997, pp. 215-225.
25. V. Milanovic, M. Gaitan, E. Bowen, and M. E. Zaghloul, "Micromachining Microwave Transmission Lines in CMOS Technology," *IEEE Transactions on Microwave and Theory Techniques,* 45(5), May 1997, pp. 630-635.
26. N. Tea, V. Milanovic, C. Zincke, J. Suehle, M. E. Zaghloul, M. Gaitan, and J. Geist, "Hybrid Post-Processing Etching for CMOS-Compatible MEMS," *Journal of Microelectromechanical Systems,* *IEEE/ASME*. 6(4). Dec. 1997, pp. 363-372*.*
27. M. E. Zaghloul*,* “MEMS and Microsystems”*, IEEE Transactions on Circuits and Systems Newsletter,* December 1998*.*
28. V. Milanovic, M. Gaitan, E. Bowen, N. Tea, and M. E. Zaghloul, "Thermoelectric Power Sensor for Microwave Applications by Commercial CMOS Fabrication," *Transactions of IEEE Electron Device Letters,* 18(9), Sept. 1997, pp. 450-452.
29. V. Milanovic, M. Ozgur. 0. DeGroot, J. Jargon, M. Gaitan, and M. E. Zaghloul, "Characterization of Broadband Transmission for Coplanar Waveguides on CMOS Silicon Substrates," *IEEE Transactions on Microwave Theory and Techniques, Special Issue on Silicon Micromachining,* 46(5), pp. 632-640, May 1998.
30. V. Milanovic, M. Gaitan, and M. E. Zaghloul, "Micromachined Thermocouple Microwave Detector by Commercial CMOS Fabrication," *IEEE Transactions on Microwave Theory and Techniques,* 46(5), pp. 550-553, May 1998.
31. Rasmussen and M. E. Zaghloul, "In the Flow with MEMS," *Electron Devices and Circuits Magazine,* 14(4), pp. 12-25, July 1998.
32. L. Sellami, S. K. Singh, R. W. Newcomb, A. Rasmussen, and M. E. Zaghloul, "VLSI Resistors for Neural Type Cell Arrays, *Journal of Circuits, Systems, and Computers, Special Issue on Analog and Digital Arrays.*
33. V. Milanovic, E. Bowen, M. Zaghloul, N. Tea, J. Suehle, and M. Gaitan, "Micro machined Convecture Accelerometers in Standard Integrated Circuits Technology,” *Journal of Applied Physics Letters,* Vol 76(4), Jan. 2000, pp. 508-518.
34. M. Ozgur, M. E. Zaghloul, and M. Gaitan, “Micro machined 28 GHZ Wilkinson divider in CMOS technology”, *IEEE Microwave and guided letter, pp. 99-101, March 2000*.
35. M. Ozgur, V. Milanovic, C. Zincke, M. Gaitan, and M. E. Zaghloul, "Quasi-TEM Characteristic Impedance of Micro machined CMOS Coplanar Wave Guides," *IEEE Transactions on Microwave Theory Techniques,* 48(5), May 2000, pp 852-853.
36. Rasmussen, M. E. Zaghloul, C. Mavriplis, O. Mikulchenko, and K. Mayaram, "Simulation and Optimization of Microfluidic Flow Sensor,” Journal *of Sensors and Actuators A,* Elsivier Sciences S. A, Vol.88, Issue2, pp 121-132, February 2001.
37. Rasmussen, L. Locascio, M. Gaitan, and M. E. Zaghloul, "Fabrication Techniques to Realize MOS-Compatible Microfluidic Microchannels," *Journal of Microelectromechanical Systems*, IEEE/ASME, Vol.10, June 2001.
38. D. Nagel, and M.E. Zaghloul, “MEMS: MicroTechnology, Mega Impact,” *IEEE Circuits and Devices Magazine*, 17(2), March 2001 (Cover page Article).
39. M. Ozgur, and M.E. Zaghloul,” MEMS Components for RF communication using CMOS technology”, *International Journal of RF and Microwave Computer–Aided Engineering*, Special Issue on RF Applications of MEMS and Micromachining, Vol. 11, No. 5, PP 330-340, Ocober2001.
40. S. Ahmadi, and M. E. Zaghloul, “A Fabry- Perot Optical Sensor System on Chip”, *Canadian Journal of Electrical and Computer Engineering,* CJCEC Vol. 26, No. 3, Dec. 2001.
41. M. Afridi, J.S. Suehle, M. E. Zaghloul, D.W. Berning, A. R. Hefner, R.E.Cavicchi, S.Semancik, C.B. Montgomery, C. J. Taylor, “ A Monolithic CMOS Micro hotplate-Based Gas Sensor System”, *IEEE SENSORS Journal,* Vol. 2, No.6, December 2002, PP644-655.
42. B.Xu, K.T. Ooi, C. Mavriplis, and M.E.Zaghloul, “Evaluation of Viscous Dissipation in Liquid Flow in Microchannels”, *Journal of Micromechanics and Microengineering*, 13, January 2003, pp 53-57.
43. P. Thaker, V. Agrawal, M. E. Zaghloul, “A Test Evaluation Technique for VLSI Circuits Using Register- Transfer Level Fault Modeling”, *the IEEE Transaction CAD for VLSI,* Volume 22, Number 8, August 2003, pp1104-1113.
44. N. Guillaume, M. Lahti, M. Cresswell, R. Allen, L. Linholm, and M. E. Zaghloul “Non-Contact Critical Dimension Metrology Sensor for Chrome Photomasks Featuring a Low Temperature Co-Fired Ceramic Technology”, the *IEEE Transactions on Semiconductor Manufacturing, February 2004.*
45. N. Guillaume, W. Khan, R. Allen, M. Cresswell, and M. E. Zaghloul, “Extension of the Application of Conformal Mapping Techniques to Parallel Conductors of Finite Dimensions”, the *IEEE Transactions on Instrumentations and Measurements*, June 2004.
46. I. Voiculoescu, M.E. Zaghloul, A. McGill, G. Fedder, “Electrically Actuated Resonant Micro cantilever in CMOS Technology for Detection of Chemical Weapons” *IEEE Sensors Journal*, Special Issue on Sensors for prevention of Terrorist Acts, Vol. 5, No. 4, August 2005, pp 641-647. (BEST PAPER AWARD IEEE Sensors Journal).
47. Yarimbiyik A.E., Schafft H.A., Allen R.A., Zaghloul M.E., Blackburn D.L., “Modeling and Simulation of Resistivity of Nanometer Scale Copper”, *Device and materials Reliability,* Volume 46, Issue 7, July 2006, pp1050-157.
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51. A. Nordin, M.E. Zaghloul, “Modeling and fabrication of CMOS Surface acoustic Resonators”, *IEEE Transaction of Microwave Theory and Techniques*, Volume55, Number 5, May 2007, pp992-1001.
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# 2. Provisional Patents:

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# Current PhD students and Master Thesis Students:

1) **PhD Students**

1. Leo De La Cruz, Using Phase Change materials (PCM) in design of reconfigurable Nano structures.
2. You Zhou Enhancement Of Piezoelectric Materials specifically 2D materials
3. Sezin Saying, Biosensors design using different materials.

**Recently Graduated**:

1. Shiqi Guo July 2019

2. Boqun Dong December 2019

3. Asha Rani August 2019

4. Yangyang Zhao December 2019

2) **Master Thesis in. Progress:**

1. Young Park