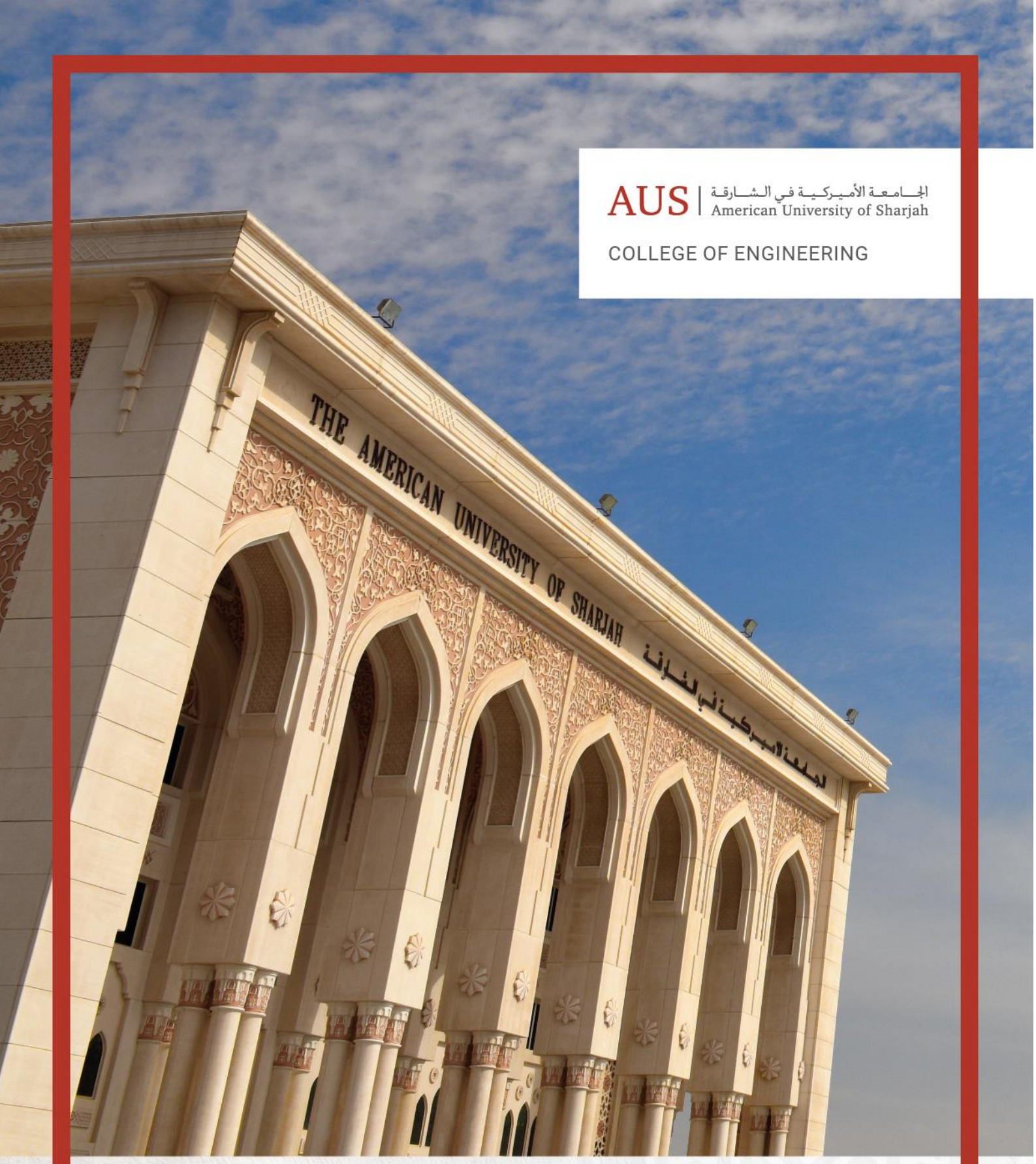

Dana Gas Endowed Chair Activity Report

August 2024

RESEARCH

• ARTICLES PUBLISHED

J1. Husseini, G.A., Sabouni, R., Puzyrev, V. and Ghommem, M., 2024. Deep Learning for the Accurate Prediction of Triggered Drug Delivery. IEEE Transactions on NanoBioscience [Q2].

J2. Najar, F., Ghommem, M., Rabenimanana, T., Hemid, M., Walter, V., Kacem, N. 2024. Differential capacitive mass sensing based on mode localization in coupled microbeam arrays. Mechanical Systems and Signal Processing, in press [Q1 - Top 2%].

J3. Alattar, B. and Ghommem, M., 2024. Exploiting nonlinearities of electrostatic MEMS resonators for tunable low pressure sensing. International Journal of Applied Mechanics [Q2].

J4. Alattar, B., Ghommem, M., Sabouni, R., Abdelkefi, A. 2024. On the use of submerged piezoelectric MFCs for dual viscosity sensing and energy harvesting. Applied Physics Letters, 124, 243901 [Q1].

J5. Ghommem, M., Hemid, M., Alattar, B., Sabouni, R., Elhady, A., Shama, Y.S., Arabi, M. and Abdel-Rahman, E.M., 2024. Development of MEMS gas sensors equipped with metal organic frameworks. Sensors and Actuators A: Physical, 371, p.115296 [Q1].

J6. ElGazar, A., Sabouni, R. and Ghommem, M., 2024. Metal-Organic Framework-Based Composites for Rapid and Sensitive Virus Detection: Current Status and Future Prospective. ChemBioEng Reviews [Q1].

J7. Alattar, B., Ghommem, M. and Puzyrev, V., 2023. Deep Learning for Nonlinear Characterization of Electrostatic Vibrating Beam MEMS. International Journal of Bifurcation and Chaos, 33(15), p.2330038 [Q1].

J8. Al Abdulla, S., Sabouni, R., Ghommem, M. and Alami, A.H., 2023. ZIF-8 coated flexible carbon cloth substrates for CO2 sensing applications. Applied Surface Science Advances, 18, p.100490 [Q1].

J9. Alattar, B., Ghommem, M., Elhady, A., Najar, F. and Abdel-Rahman, E.M., 2023. Tracking of bifurcations and hysteresis in electrostatically actuated resonators by motion induced current. Mechanical Systems and Signal Processing, 204, p.110808 [Q1 – Top 2%].

J10. Al Abdulla, S., Sabouni, R., Ghommem, M. and Alami, A.H., 2023. Synthesis and

performance analysis of zeolitic imidazolate frameworks for CO2 sensing applications. Heliyon, 9(11) [Q1].

J11. Pour, P.D., Ghommem, M. and Abdelkefi, A., 2023. Modeling and Design Enhancement of Electrothermal Actuators for Microgripping Applications. Applied Sciences, 13(18), p.10140 [Q2].

• CONFERENCES

C1. Ghommem, M., Najar, F. Walter, V. , and Kacem, N., 2024, Modeling and Experimental Verification of Coupled Beam Arrays for Mass Sensing, The 19th IEEE International Conference on Nano/Micro Engineered and Molecular Systems, Kyoto, Japan.

C2. Hemid, M., Alattar, B., Ghommem, M., Ahmed, A., Abdel-Rahman, E. and Sabouni, R., 2024, February. Motion Detection Method of Electrostatic MEMS Resonators Operating in Aqueous Media. In 2024 6th International Youth Conference on Radio Electronics, Electrical and Power Engineering (REEPE), Sharjah, United Arab Emirates, (pp. 1-6). IEEE.

C3. Alattar, B., Ghommem, M. and Hemid, M., 2023, December. Low Pressure MEMS Sensor: Analysis and Experimental Demonstration. In 2023 IEEE 22nd International Conference on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS), Abu Dhabi, United Arab Emirates, (pp. 256-259). IEEE.

C4. Ghommem, M., Alattar, B., Lherbette, M., Elhady, A. and Abdel-Rahman, E., 2023, July. Motion measurement methods for nonlinear analysis of electrostatic mems resonators. In IEEE EUROCON 2023-20th International Conference on Smart Technologies, Torino, Italy (pp. 632-637). IEEE.

• RESEARCH GRANTS

- Faculty Research Grant [PI] “Design and Development of Innovative Portable Florescence Based Biosensing Platform for Simultaneous Detection of Multiple RNA Virus Sequences”

- Postdoctoral Fellowship Award [PI] “Assessment of fatigue behavior of piezoelectric materials for energy harvesting and sensing/actuation applications”

• RESEARCH AWARDS/RECOGNITION

- Recipient of the College of Engineering Outstanding Interdisciplinary Research Team Award (May 2024). Ghommem, M., Sabouni, R., Majdalawieh, A., Abel-Rahman, E., and Puzyrev, V., Multidisciplinary Research Empowering Innovative Solutions in Sensing Applications.

- The project titled “Multidisciplinary Research Empowering Innovative Solutions in Gas Sensing Applications” has been shortlisted for the upcoming 2024 Times Higher Education (THE) Awards - Arab World in the category *Research Project of the Year: STEM*.

- Ranked as World’s Top 2% most-cited scientists by Stanford University for the fourth year in a row [single year category].

Teaching

TEACHING

• ACADEMIC ACTIVITIES

- Represented the college at a booth dedicated to the American University of Sharjah in the COP-28 Greening Education Hub on December 10, 2023.
- Educational initiative: Design, Build, and Fly - a collaborative training program with University of California, Irvine, USA

• INTERNATIONAL COLLABORATION

Dr. Mehdi Ghommem visited AGH University of Technology and Science, Krakow (Poland) to give a seminar, reconnect with a research group, and explore research collaboration opportunities. He discussed different ways of collaboration such as engaging in joint research projects, writing joint proposals and seeking funding agencies in Europe and UAE, exchange of students, co-supervision of graduate students, co-organization of conferences, etc.

KNOWLEDGE TRANSFER

• COMMUNITY ENGAGEMENT

In collaboration with CEN Endowed Chairs

Symposium on building sustainable solutions towards net zero emissions [December 5, 2023]

- The symposium addressed various topics centered around sustainability and discussed ways in which university engagement and corporate dedication are tackling climate change and in the drive to the UAE's goal of net zero emissions by 2050.
- The symposium brought together a diverse array of 150+ participants from academia, industry, and government, encompassing a wide range of backgrounds and disciplines. The symposium included keynote presentations by esteemed speakers from academia and industry, panel discussions conducted by AUS alumni, booth exhibition, and student poster competition.
- The symposium was organized by the Engineering Endowed Chairs in partnership with Fine Hygienic and sponsored by Sharjah National Oil Corporation (SNOC), Asian Paints, and Emirates Beton Ready Mix (EB).

Forum on fostering collaboration with local governmental and industrial communities for sustainable development [April 30, 2024]

The forum included presentations by the CEN Endowed Chairs, Associate Dean of research and graduate affairs and senior manager of internship, placement, and executive education.
Representatives from 5 governmental entities and industry participated in a roundtable discussion on potential collaborations with AUS faculty/ researchers that address their needs.

• SEMINARS

Delivered 2 seminars:

- Ghommem, M., “Exploiting nonlinearities of electrostatic Micro-Electro Mechanical Systems (MEMS) resonators for sensing applications”, New York University Abu Dhabi (Engineering Seminar Series), October 16, 2023.
- Ghommem, M., “A MEMS gas sensor for quality and environmental safety”, American University of Sharjah (CEN Lecture Series), October 3, 2023

• GUEST SPEAKERS

Host 3 guest lecture series:

- Dr. Nouha Alcheikh, Khalifa University, UAE “Magnetic and Gas Sensors Based on Electrothermally Actuated MicroResonators”, November 22, 2023.
- Dr. Imran Malik (Caltech graduate), Universal Diagnostics Pvt, Pakistan (CEO) “Optical Design for Fluorescence Detection in Portable Medical and Lab on Chip Devices”, February 8, 2024.
- Dr. Haithem Taha, University of California, Irvine, USA “Vibration Control: Mysterious Stabilization Mechanism in Bioinspired Flying Robots”, February 22, 2024.

• MEDIA AND E-COVERAGE

TV show appearance

Together with Dr. Rana Sabouni, Associate Professor of Chemical and Biological Engineering, Dr. Mehdi Ghommem was interviewed on Sharjah TV’s ‘Amasi’ show (October 17, 2023). The interview centered around two technologies in our research. These are sustainable synthesis methods for nanomaterials and micro-electromechanical systems (MEMS) technology, a process technology used to create tiny integrated devices or systems that combine mechanical and electrical components.

News release

An article entitled “Sensor Technology research by CEN faculty envisions a safer and healthier tomorrow”, highlighting the collaborative research on the development of miniature sensors was published in the AUS website on October 10, 2023.

FUTURE ACTIVITIES

The 8-th international conference on smart materials and nanotechnology in engineering (SMN 2024), November 25-28, 2024

Main Chairman

Look forward to your participation at SMN 2024!

THE TEAM

Dr. Mehdi Ghommem (Team leader)

Associate Professor of Mechanical Engineering Dana Gas Endowed Chair in Engineering PhD in Engineering Mechanics, Virginia Tech, USA

100+ journal papers / 60+ international conferences / 1 granted patent and 3 US patent applications

Research focus areas: nonlinear dynamics, MEMS, and bio-robotics

Dr. Dheeraj Tripathi | Postdoctoral Fellow (PhD in Mechanical Engineering)

Dr. Renuka Ved Parkash | Postdoctoral Fellow (PhD in Chemical Engineering)

Basil Alattar | Research Assistant (Master in Mechatronics Engineering)

Mohamed Hemid | Master Student (Mechatronics Engineering)

Aya ElGazar | Master Student (Chemical Engineering)

Zakaria Saibaa | Master Student (Mechanical Engineering)

Mohammed Al-Hadi | Master Student (Mechanical Engineering)

Heba Abed | Master Student (Biomedical Engineering)