

Adel Elsabbagh

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RESEARCH INTERESTS Finite Element Modeling, Smart Materials and Structures, Wind Energy, Topology Optimization, Viscoelastic Damping, Energy Harvesting.

EDUCATION **University of Maryland**, College Park, MD, USA

- Ph.D., Mechanical Engineering, December 2005
 - Dissertation Topic: Gas-Filled Axisymmetric Acoustic Resonators
 - Advisor: Prof. Amr Baz
- M.Sc., Mechanical Engineering, June 2004
 - Non-thesis Master.

Ain Shams University, Abbasia, Cairo, Egypt
Department of Design and Production Engineering

- M.Sc., Mechanical Engineering, May 2001
 - Thesis Topic: Application of Petri Nets in Production Scheduling
 - Advisor: Prof. Amin El-Kharboutly
- B.Sc., Mechanical Engineering, June 1998

HONORS AND AWARDS

- Ain Shams University Graduate Research Assistantship **1998 - 2001**
- University of Maryland Graduate Research Assistantship **2001 - 2005**
- University of Maryland Research Associate for one year **2006**
- Funding from the Spanish Agency for International Development **2008**
for the research project “Use of Phononic Crystals in Acoustic Control”
in cooperation with the Polytechnic University of Valencia (VPU).
- University of Maryland Research Associate for six weeks **2006**
- Director of the Center for Small-Scaled Industries at the Faculty of **2007 - 2011**
Engineering for two successive periods
- Funding from the Swedish Research Links Programme for the project **2009 - 2011**
“Simulation of High Frequency Sound Propagation in Duct Systems”
in cooperation with the Royal Institute of Technology in Sweden (KTH)
- Applications of topology optimization in structural dynamics, Invited **2009**
speaker at Chongqing University, July 2009.
- Funding from the EU TEMPUS Programme for the project “Advanced **2010 - 2013**
Engineering Systems: Bridging the Gap Between Academia and Industry”
in cooperation with University of Oviedo in Spain and other partners.
- Funding from the Science & Technology Development Fund (STDF) **2010 - 2013**
for the project “Innovative Techniques for the Design and Manufacturing
of Wind Turbine Blades”.

- Associate professor, Design and Production Engineering Department (ASU) **2012**
- Funding from the Ministry of Scientific Research for the project “Effect of Rotation Speed on the Vibrations of Composite Rotating Beams with Applications to Wind Turbine Blades”. **2014**
- Egyptian State Award from the Ministry of Scientific Research **2014**
- Professor of Mechanical Vibrations, Design and Production Engineering Department (ASU) **2017**
- Coordinator of the Design and Production Engineering program **2018**
- Director of the Center For Applied Research (ASU) **2019 – Now**
- Funding from the Science & Technology Development Fund (STDF) for the project “Improving Air Handling Units at Tanta Motors to Meet Exportation Norms”, PI. **2019 – Now**

ACADEMIC
EXPERIENCE

Ain Shams University, Abbaseya , Cairo, Egypt

Assistant Professor, Associate Professor, Professor **2007 - Now**

Participating in teaching the following courses:

- Acoustics for undergraduate level,
- Mechanical Vibrations for undergraduate level,
- Finite Element Method for postgraduate level,
- Vibration Measurement for engineers.
- Modeling and Simulation for undergraduate level.

Graduate Student **1998 - 2001**

Includes M.Sc. research and coursework.

Teaching Assistant **1998 - 2001**

Duties at various times have included office hours and leading weekly lab exercises and problem solving sessions

- Operations Research,
- Production Management,
- Production Processes,
- Metrology,
- Engineering Materials.

University of Maryland, College Park, MD, USA

Graduate Student **2001 - 2005**

Includes Ph.D. research, Ph.D. and Masters level coursework and research/consulting projects.

PUBLICATIONS

1. S. Okda, V. Chernoray, A. Elbanhawy, W. Akl, and A. Elsabbagh “Testing of the Aerodynamic Characteristics of an Inflatable Airfoil Section”, Journal of Aerospace Engineering 33 (5), 04020061.
2. S. Okda, W. Akl, A. Elsabbagh, Structural behaviour of inflatable PVC fabric cylindrical tubes, IOP Conference Series: Materials Science and Engineering 610 (1), 012075.

3. Ahmed H Abdulaziz, M. Hedaya, J. McCrory, Karen M Holford, Adel Elsabbagh, (2019), Parametric Study of Honeycomb Composite Structure Using Open Source Finite Element Software, *27th UK Association of Computational Mechanics Conference*, City, University of London, London, England.
4. Z Pengyun; Z Ling; D Jie; A Elsabbagh; X Shuhong; Y Tingfei; W Yao, Flexural wave concentration in tapered cylindrical beams and wedge-like rectangular beams with power-law thickness, *Journal of Sound & Vibration*, Accepted in April 2019.
5. MM Kasem, H Negm, A Elsabbagh, Aeroelastic Modeling of Smart Composite Wings Using Geometric Stiffness, *Journal of Aerospace Engineering* **32** (2), 2018.
6. T. Elnady, A. Elsabbagh, AH Abdulaziz, Testing and Validation of a Novel Segmented Wind Turbine Blade, *Journal of Testing and Evaluation* **47**(5), 2018.
7. M. Gaber, T. Elnady, A. Elsabbagh, Sound Source Localization in 360 Degrees Using a Circular Microphone Array, *Euronoise, Crete*, 2018.
8. M. Yangui, S. Bouaziz, M. Taktak, M. Haddar, and A. El-Sabbagh, Nonlinear Analysis of Twisted Wind Turbine Blade, *Journal of Mechanics*, 2018.
9. El-Wahab, R.A.M., Kotb, A., Salem Eid, A., El-Gammaz, S.M., El-Sabbagh, A.M.M., A novel method for fixation of Weber B distal fibular fractures: A biomechanical comparative study of posterolateral versus lateral neutralization plating, *Current Orthopaedic Practice*, 2018.
10. Mahran, M., Elsabbagh, A., Negm, H, A comparison between different finite elements for elastic and aero-elastic analyses, *Journal of Advanced Research*, 2017.
11. A. Allam, A. Elsabbagh, W. Akl, Experimental demonstration of one-dimensional active plate-type acoustic metamaterial with adaptive programmable density, *Journal of Applied Physics*, **121** (12), 2017.
12. A. Allam, A. Elsabbagh, W. Akl, Modeling and design of two-dimensional membrane-type active 2 acoustic metamaterials with tunable anisotropic density, *Journal of the Acoustical Society of America*, Published Online: Nov 2016, Accepted: Oct 2016.
13. A. Elsabbagh, Nonlinear Finite Element Model for the Analysis of Axisymmetric Inflatable Beams, *Thin-Walled Structures*, **96**, 2015, 307 – 313.
14. A. Abdulaziz, A. Elsabbagh, and T. Elnady, Using Acoustics Emission In Validating a New Design and Manufacturing Concepts of a Horizontal Axis Wind Turbine Blade, *ICSV22, 22nd International Conference on Sound and Vibration*, Florence, July 2015.
15. A. Zein, T. Elnady, and A. Elsabbagh, e-Laboratories for Sound and Vibration Education, *ICSV22, 22nd International Conference on Sound and Vibration*, Florence, July 2015.
16. M. Mahran, H. Negm, A. El-Sabbagh, and K. Maalawi, Aero-elastic analysis of composite plate swept wings using the finite element method, *ICCS18, 18th International Conference on Composite Structures*, Lisbon, June 2015.
17. A. Abdulaziz, A. Elsabbagh, W. Akl, Dynamic and Static Characterization of Horizontal Axis Wind Turbine Blades Using Dimensionless Analysis of Scaled-Down Models, *International Journal of Renewable Energy Research-IJRER*, **5**, 2015.
18. M. Mahran, H. Negm, and A. El-Sabbagh, Aero-elastic characteristics of tapered plate wings, *Finite Elements in Analysis and Design*, **94**, 2015, 24–32.
19. M. Hedaya, A. Elsabbagh, and A. Hussein, Weight minimization of truss structures subjected to dynamic loading, *EngOpt2014 - 4th International Conference on Engineering Optimization*, Lisbon, Sept 2014.
20. M. Hedaya, A. Elsabbagh, and A. Hussein, Safety factor maximization for trusses subjected to fatigue stresses, *Engineering Optimization*, **47**(8), 2015, 1107-1124.
21. A. El-Sabbagh, and A. Baz, Topology optimization of unconstrained damping treatments for plates, *Engineering Optimization*, 2013, 1-16, DOI 10.1080/0305215X.2013.832235.
22. A. El-Sabbagh, Size optimization of stiffeners in bending plates, *Mechanics of Advanced Materials and Structures*, **20**, 2013, 764-773.
23. W. Akl, A. Elsabbagh, A. Baz, Acoustic metamaterials with circular sector cavities and programmable densities, *Journal of the Acoustical Society of America*, **132** (4), 2012,

24. A. El-Sabbagh, I. Taha, and R. Taha, Prediction of the modulus of elasticity of short fiber reinforced polymer composites by finite element modelling, *Polymers and Polymer Composites*, **19** (9), 2011, 733-742.
25. A. El-Sabbagh, and A. Baz, Maximization of the harvested power from piezoelectric bimorphs with multiple electrodes under dynamic excitation, *Finite Elements in Analysis and Design*, **47**, 2011, 1232-1241.
26. Z. Ling, X. Ronglu, W. Yi, and A. El-Sabbagh, Topology optimization of constrained layer damping on plates using Method of Moving Assymptote (MMA) approach, *Shock and Vibration*, **18**, 2011, 221-244.
27. M. Ramadan, W. Akl, T. Elnady, and A. Elsabbagh, Finite-element modeling of an acoustic cloak for three-dimensional flexible shells with structural excitation, *Applied Physics A, Materials Science & Processing*, **103**, 2011, 641-644.
28. Z. Ling, W. Yi, Z. Dongdong, L. Yinong, and A. Elsabbagh, Vibration and damping characteristics of cylindrical shells with active constrained layer damping treatments under parametric variations, *17th International Congress for Sound & Vibration (ICSV17)*, Cairo, Egypt, 18-22 July, 2010.
29. Z. Ling, X. Ronglu, H. Zhimin, A. Elsabbagh, and A. Baz, Topology optimization of damping material layout to enhance energy eissipation of cylindrical shells, *17th International Congress for Sound & Vibration (ICSV17)*, Cairo, Egypt, 18-22 July, 2010.
30. A. Elsabbagh, T. Elnady, and W. Akl, Using virtual reality environment in the teaching of acoustics, *17th International Congress for Sound & Vibration (ICSV17)*, Cairo, Egypt, 18-22 July, 2010.
31. W. Akl, T. Elnady, A. Elsabbagh, and M. Ramadan, Improving acoustic cloak bandwidth using nonlinear coordinate transformation, *17th International Congress for Sound & Vibration (ICSV17)*, Cairo, Egypt, 18-22 July, 2010.
32. X. Ronglu, H. Zhimin, Z. Ling, and A. El-Sabbagh, Topology optimization of damping material layout to enhance energy dissipation of plates, *The Third International Conference on Dynamics, Vibration and Control (ICDVC 2010)*, Hangzhou, China, 12 – 14 May 2010.
33. M. Ramadan, W. Akl, T. Elnady, A. El-Sabbagh, Finite element modeling of an acoustic cloak for three dimensional flexible shells with structural excitation, *META'10, 2nd International Conference on Metamaterials, Photonic crystals and Plasmonics*, Cairo, Egypt, 22 – 25 Feb 2010.
34. T. Elnady, A. Elsabbagh, W. Akl, O. Mohamady, V. Garcia-Chocano, D. Torrent, F. Cervera, and J. Sánchez-Dehesa, Quenching of acoustic bandgaps by flow noise, *Applied Physics Letters*, **94**, 2009.
35. W. Akl, A. El-Sabbagh, K. Al-Mitani, and A. Baz, Topology Optimization of a Plate Coupled with Acoustic Cavity, *International Journal of Solids and Structures*, **46**, 2009.
36. A. El-Sabbagh, W. Akl, and A. Baz, Topology Optimization of Periodic Mindlin Plates, *Journal of Finite Elements in Analysis and Design*, **44**, 2008, p 439-449.
37. W. Akl, A. El-Sabbagh, and A. Baz, Optimization of the Static and Dynamic Characteristics of Plates with Isogrid Stiffeners, *Journal of Finite Elements in Analysis and Design*, **44**, 2008, p 513-523.
38. W. Akl, A. El-Sabbagh, K. Al-Mitani, and A. Baz, Topology optimization of a plate coupled with acoustic cavity, *Proceedings of SPIE*, **6928**, Active and Passive Smart Structures and Integrated Systems, 2008.
39. W. Akl, A. El-Sabbagh, and A. Baz, Finite Element Modeling of Plates with Arbitrary Oriented Isogrid Stiffeners, *Mechanics of Advanced Materials and Structures*, **15**, 2007, p 130-141.
40. A. El-Sabbagh, and A. Baz, Nonlinear Oscillations of Acoustic Resonators, *Proceedings of Smart Structures and Materials*, China, 2007.
41. L. Zheng, Y. Li, A. Baz, and A. El-Sabbagh, The Application of Nonlinear Energy Sinks Controller in a Full Car Semi-Active Suspension System with MR Dampers, *Proceedings of Smart Structures and Materials*, China, 2007.

42. A. El-Sabbagh, and A. Baz, A coupled nonlinear model for axisymmetric acoustic resonators driven by piezoelectric bimorphs, *Mechanics of Advanced Materials and Structures*, **13**, 2006, p 205-217.
43. A. El-Sabbagh, and A. Baz, Finite element modeling of the nonlinear oscillations in axisymmetric acoustic resonators, *Journal of Finite Elements in Analysis and Design*, **42**, 2006, p 1281-1290.
44. A. El-Sabbagh, and A. Baz, Vibration control of beams using constrained layer damping with functionally graded viscoelastic cores: Theory and experiments, *Proceedings of SPIE*, **6169**, Smart Structures and Materials 2006: Damping and Isolation, 2006.
45. A. El-Sabbagh, and A. Baz, Effect of static, dynamic, thermal and humidity loading on fatigue Life of fiber optic cables, *Mechanics of Advanced Materials and Structures, Proceedings of SPIE*, **5391**, Smart Structures and Materials 2004: Sensors and Smart Structures Technologies, p 274-285, 2004.
46. A. El-Sabbagh, and A. El-Kharboutly, Applications of Petri nets in production scheduling, *PEDD6*, 2002.

PRESENTATIONS

- A. El-Sabbagh, and A. Baz, Vibration control of beams using constrained layer damping with functionally graded viscoelastic cores: Theory and experiments, Smart Structures and Materials 2006: Damping and Isolation, 2006.
- A. El-Sabbagh, Applications of topology optimization in structural dynamics, Invited speaker at Chongqing University, July 2009.

BOOKS

- Adel Elsabbagh, Gas-Filled Axisymmetric Acoustic Resonators: Acoustic Compressor, VDM Verlag, 2008, ISBN: 3639093046.
- Mahran Mohamed, Negm Hani, Elsabbagh Adel, Aero-elastic Analysis of Plate Wings Using the Finite Element Method, Lambert Academic Publishing, ISBN: 3659679690.
- Adel Elsabbagh, Introduction to Finite Element Modeling for Engineers, registration number 2016-16360, Egyptian National Library and Archives.

REVIEWER

Journal of Finite Element in Analysis and Design, Published by Elsevier.
 Ain Shams Engineering Journal, Published by Elsevier.
 Journal of Aerospace Engineering, Published by Elsevier.
 Journal of Thin-Walled Structures, Published by Elsevier.
 Journal of the Acoustical Society of America (JASA).

PROFESSIONAL EXPERIENCE

Smart Materials & Structures Research Center, College Park, Maryland USA

Research Assistant

September, 2001 - December, 2005

Working on many research projects including developing an “acoustic compressor” during the Ph.D. Also worked on project in vibration damping using constrained layer viscoelastic treatments, health monitoring of MD 140 Westchester bridge, etc.

Research Associate

January, 2006 - 2007

After graduation, I have been offered a post doctoral position in the same center where I worked on topology optimization for structures.

ASU Sound & Vibration Lab, Cairo, Egypt.

Member

January, 2007 - Now

Working in consultation projects including

- Environmental Impact Assessment (EIA) of the construction work in the new runway at Cairo airport.
- Noise control of centrifugal pumps at Rod Elfarag pumping plant for potable water.

- Environmental Impact Assessment (EIA) of Abu Dhabab Mine project.
- Noise control of air conditioning units in Safeer Hotel.
- Design of skids for oil pumps in Tanzania for Mantrac, Egypt.
- Noise study for Khafji Joint Operations, Saudi Arabia.
- Analysis of vibration levels predicted due to the installation of presses at Olympic Factory.
- Design of Vibration Isolation for a 350 ton presses at Olympic factories.
- Design and vibration analysis of power generation skids for Mantrac Petro-Shahd.
- Vibration Analysis for Electrolux, 2016.
- Vibration of powder gyratory screener for Unilever, 2017.

Center For Applied Research, Cairo, Egypt.

Director

Sept, 2019 - Now

Working in consultation projects including

- Vibration Isolation of HVAC equipment.
- Design and Manufacturing of a Measuring Device for the Monorail project.
- Design and Manufacturing of a Calibrator for the Monorail project.
- Vibration and Noise mitigation for a sewage water treatment plant (Orasqualia).

Center for Development of Small-Scale Industries, Cairo, Egypt.

Director

November, 2007 - 2011

Member

November, 2011 - 2017

Participation in the following projects:

- Type testing of water flow meters for the Water Holding Co.
- Conceptual design of a 1.5 MW wind turbine.
- Design of Hydrostatic Testing Machine of Concrete Pipes, NPC Co.
- Analysis of the causes of excessive vibrations and design modifications for industrial fans at Royal Cement Co.
- Failure analysis of semi-trailers for Arab Contractors Co.
- Analysis of the causes of excessive vibrations in Camilla washing machines produced by GMC.
- Failure analysis for Gearboxes at P&G.
- Failure analysis of piping systems in Sheikh Zayed City.
- Failure of asphalt crushers.

STUDENTS CO-
SUPERVISION

- Mohamed Hedaya, Optimization of Skeleton Structure Design under Dynamic Loading, Ph.D., 2009 – 2015.
- Shady Sedky, A Novel Method for Fixation of Weber B Distal Fibular Fractures Using Posterolateral Plating A Biomechanical Comparative Study versus Lateral Neutralization Plating, Ph.D., 2009 – 2014.
- Eman Zidan, Noise Prediction Models of Wind Turbines, M.Sc., 2010 – 2016.
- Mohamed Kasem, Tailoring of Composite Swept Wings for Enhanced Aero-elastic Characteristics, M.Sc., 2010 – 2014.
- Ahmed Okasha, Source Characterization of compressors and mitigation measure of vibration induced failures, M.Sc., 2011 – 2014.
- Ahmed Abdulaziz, Testing of Segmented Wind Turbine Blade, M.Sc., 2012 – 2017.
- Ahmed Allam, Wave Propagation Control Using Active Acoustic Metamaterials, M.Sc., 2013 – 2017.
- Julia Fahim, Structural Optimization of Horizontal Axis Wind Turbine Blades, M. Sc., 2014

– 2018.

- Mohamed Kasem, Improving Elastic and Aeroelastic Performance of Aircraft Wings Using Piezoelectric Actuators, Ph.D., 2015 – 2018.
- Sherif Okda, Design and Manufacturing of Inflatable Wind Turbine Blades, M. Sc., 2015 – 2019.
- Bahi Bakir, Using Finite Element Method for the Design of Micro-plates Subjected to Residual Stresses in MEMS Applications, 2015 – Present.
- Ahmed Abdulaziz, Investigation of Honeycomb composite structure for wind turbine blades with Acoustics Emissions damage assessment, Ph.D., 2019 – Present.

ACADEMIC ACTIVITIES

- Main supervisor of the ASUWind team
Achieved 2nd rank in 2018 in the International Small Wind Turbine Contest in Netherlands.
Achieved 2nd overall rank plus best Annual Energy Production and best Turbine Manufacturing in 2019 in the International Small Wind Turbine Contest in Netherlands.

REFERENCES

Prof. Amr M. Baz, University of Maryland, College Park, MD. USA
Prof. Amin K. El-Kharboutly, Ain Shams University, Cairo, Egypt.
Prof. Mohamed A. El-Hakim, Ain Shams University, Cairo, Egypt.