

Bekir Bediz

CONTACT INFORMATION

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ACADEMIC

Sabanci University (SU), Istanbul, Turkey

Assistant Professor, Mechatronics Engineering Program, August 2016 — Present

Carnegie Mellon University (CMU), Pittsburgh, PA, USA

Post-doctoral Research Associate, Mechanical Engineering, February 2015 — July 2015

Ph.D., Mechanical Engineering, December 2014

Dissertation: Three dimensional dynamics of micro tools and miniature ultra-high-speed spindles

Advisor: Prof. O. Burak Ozdoganlar

Middle East Technical University (METU), Ankara, Turkey

M.Sc., Mechanical Engineering, July 2009

Dissertation: In vivo human tibial bone strength measurement by modal vibration analysis

Advisors: Prof. H. Nevzat Ozguven, Prof. Feza Korkusuz

B.S., Mechanical Engineering, June 2006

JOURNAL PUBLICATIONS

1. Ozcevik, B., Soylemez, E., **Bediz, B.**, Simsek, U., 2023, ‘Effects of particle damper design parameters on the damping performance of laser powder bed fused structures’, *The International Journal of Advanced Manufacturing Technology*, (in review).
2. Shahabad, P. K., Alan, S., Yildizdag, E., **Bediz, B.**, 2023, ‘A novel spectral element method with a NURBS-based high-order coarse quad mesh approach to design laminated composite panels with arbitrarily shaped cutouts’, *Journal of Sound and Vibration*, (in review).
3. Shahabad, P. K., Anamagh, M. R., Serhat, G., Basdogan, I., **Bediz, B.**, 2023, ‘Advanced lamination parameter interpolation and extrapolation methods for designing manufacturable variable stiffness laminates’, *Composite Structures*, (in review).
4. Motlagh, P. L., **Bediz, B.**, Kefal, A., 2023, ‘Analysis of Smart Laminated Composites Integrated with Piezoelectric Patches Using Spectral Element Method and Lamination Parameters’, *Journal of Sound and Vibration*, (in review).
5. Lotfan, S., Dedeboy, D. **Bediz, B.**, Cigeroglu, E., 2023, ‘A weak-form spectral Chebyshev technique for nonlinear vibrations of rotating functionally graded beams’, *Mechanics of Advanced Materials and Structures*, doi: 10.1080/15376494.2023.2181472.
6. Anamagh, M. R., Shahabad, P. K., Serhat, G., Basdogan, I., **Bediz, B.**, 2023, ‘Eigenfrequency optimization of variable stiffness manufacturable laminates using spectral Chebyshev approach and lamination parameters’, *Mechanics of Advanced Materials and Structures*, doi: 10.1080/15376494.2023.2180554.
7. Anamagh, M. R., Gokalp, K., Akyildiz, T. A., Alan, S., Kaya, K., **Bediz, B.**, 2023, ‘A hybrid CPU-GPU solver based on three-dimensional spectral Chebyshev technique for determining the dynamic behavior of thick sandwich panels’, *Engineering Analysis with Boundary Elements*, v.147, 181-194.

8. Shekhar, S., **Bediz, B.**, Ozdoganlar, O. B., 2023, ‘Predicting the tool-tip dynamics in ultra-high-speed micromachining applications’, *International Journal of Machine Tool & Manufacture*, v.185, 103981.
9. **Bediz, B.**, 2022, ‘Yapıların Yüksek Doğruluklu Modal Analizi İçin Otomatik Darbe Tahrik Sistemi’, *International Journal of Advances in Engineering and Pure Sciences*, v.34(2), 317-327.
10. Lotfan, S., **Bediz, B.**, 2022, ‘Free vibrations of rotating pre-twisted blades including geometrically nonlinear pre-stressed analysis’, *Journal of Sound and Vibration*, v.535, 117109.
11. Sumer, Y., **Bediz, B.**, 2022, ‘Çok Fonksiyonlu Paralel Geçit ve Yüzme Merdiveni Tasarımı ve Analizi’, *Makina Tasarım ve İmalat Dergisi*, v.20(1), pp. 1-11.
12. Seyyedrahmani, F., Shahabad, P. K., Serhat, G., **Bediz, B.**, Basdogan, I., 2022, ‘Multi-objective optimization of composite sandwich panels using lamination parameters and spectral Chebyshev method’, *Composite Structures*, v.289, 115417.
13. Shahabad, P. K., Anamagh, M. R., **Bediz, B.**, 2022, ‘Design of laminated conical shells using spectral Chebyshev method and lamination parameters’, *Composite Structures*, v.281, 114969.
14. Lotfan, S., Anamagh, M. R., **Bediz, B.**, Cigeroglu, E., 2022, ‘Nonlinear resonances of axially functionally graded beams rotating with varying speed including Coriolis effects’, *Nonlinear Dynamics*, v.107, pp. 533–558.
15. Sarabi, M. R., **Bediz, B.**, Falo, L. D, Korkmaz, E., Tasoglu, S., 2021, ‘3D printing of microneedle arrays: challenges towards clinical translation’, *Journal of 3D Printing in Medicine*, v.5(2), pp. 65-70.
16. Alan, S., **Bediz, B.**, 2021, ‘A novel electromechanical spectral element method for piezoelectric energy harvester plates’, *Journal of Sound and Vibration*, v.505, 116139.
17. Lotfan, S., Anamagh, M. R., **Bediz, B.**, 2021, ‘A general higher-order model for vibration analysis of axially moving doubly-curved panels/shells’, *Thin-Walled Structures*, v.164, 107813.
18. Motlagh, P. L., Anamagh, M. R., Basdogan, I., **Bediz, B.**, 2021, ‘Electromechanical analysis of functionally graded panels with surface-integrated piezo-patches for optimal energy harvesting’, *Composite Structures*, v.263, 113714.
19. Lotfan, S., Biglari, H., Choupani, A., **Bediz, B.**, 2021, ‘Dynamics of carbon nanotubes under thermally induced nanoparticle transport on helical tracks’, *Applied Mathematical Modeling*, v.93, pp. 684-707.
20. Anamagh, M. R., **Bediz, B.**, 2020, ‘Free vibration and buckling behavior of functionally graded porous plates reinforced by graphene platelets using spectral Chebyshev approach’, *Composites Structures*, v.253, pp. 112765.
21. Motlagh, P. L., **Bediz, B.**, Basdogan, I., 2020, ‘A spectral Tchebychev solution for electro-mechanical analysis of thin curved panels with multiple integrated piezo-patches’, *Journal of Sound and Vibration*, v. 486, pp. 115612.
22. Sumer, Y., **Bediz, B.**, 2020, ‘Çok Fonksiyonlu Paralel Geçit Merdiveni Tasarımı, Analizi ve Üretimi’, *Makina Tasarım ve İmalat Dergisi*, v.18 (2), pp. 92-105.
23. Serhat, G., Anamagh, M. R., **Bediz, B.**, Basdogan, I., 2020, ‘Dynamic analysis of doubly-curved composite panels using lamination parameters and spectral-Tchebychev method’, *Computers and Structures*, v.239, pp. 106294.

24. Serhat, G., **Bediz, B.**, Basdogan, I., 2020, ‘Unifying lamination parameters with spectral-Tchebychev method for variable-stiffness composite plate design’, *Composite Structures*, v.242, pp. 112183.
25. **Bediz, B.**, Ozdoganlar, O. B., 2019, ‘Rotational Dynamics of Micro-Scale Cutting Tools’, *Precision Engineering*, v.60, pp. 1-11.
26. Aghakhani, A., Motlagh, P. L., **Bediz, B.**, Basdogan, I., 2019, ‘A general electromechanical model for plates with integrated piezo-patches using spectral-Tchebychev method’, *Journal of Sound and Vibration*, v.458, pp. 74-88.
27. Anamagh, M. R., **Bediz, B.**, 2019, ‘Three-dimensional dynamics of functionally graded and laminated doubly-curved composite structures having arbitrary geometries and boundary conditions’, *Composites: Part B*, v.172, pp. 533-546.
28. **Bediz, B.**, 2018, ‘A spectral-Tchebychev method for thick plates having arbitrary geometry under mixed boundary conditions’, *Journal of Sound and Vibration*, v.432, pp. 272-289.
29. **Bediz, B.**, 2018, ‘Three-dimensional vibration behavior of bi-directional functionally graded curved parallelepipeds using spectral Tchebychev approach’, *Composite Structures*, v.191, pp. 100-112.
30. **Bediz, B.**, Aksoy, S., 2018, ‘A spectral-Tchebychev solution for three-dimensional dynamics of curved beams under mixed boundary conditions’, *Journal of Sound and Vibration*, v.413, pp. 26-40.
31. Korkmaz, E., Gozen, B. A., **Bediz, B.**, Ozdoganlar, O. B., 2017, ‘Accurate measurement of micromachining forces through dynamic compensation of dynamometers’, *Precision Engineering*, v.49, pp. 365-376.
32. **Bediz, B.**, Romero, L. A., Ozdoganlar, O. B., 2015, ‘Three dimensional dynamics of rotating structures under mixed boundary conditions’, *Journal of Sound and Vibration*, v.358(8), pp. 176–191.
33. **Bediz, B.**, Gozen, B. A., Korkmaz, E., Ozdoganlar, O. B., 2014, ‘Dynamics of ultra-high-speed (UHS) spindles used for micromachining’, *International Journal of Machine Tools and Manufacture*, v.87, pp. 27-38.
34. **Bediz, B.**, Korkmaz, E., Ozdoganlar, O. B., 2014, ‘An impact exScholar citation system for repeatable, high-bandwidth modal testing of miniature structures’, *Journal of Sound and Vibration*, v.333, pp. 2743-2761.
35. Filiz, S., **Bediz, B.**, Romero, L. A., Ozdoganlar, O. B., 2014, ‘Three dimensional dynamics of pretwisted beams: A spectral-Tchebychev solution’, *Journal of Sound and Vibration*, v.333, pp. 2823-2839.
36. Korkmaz, E., **Bediz, B.**, Gozen, B. A., Ozdoganlar, O. B., 2014, ‘Dynamic characterization of multi-axis dynamometers’, *Precision Engineering*, v.38(1), pp. 148-161.
37. **Bediz, B.**, Korkmaz, E., Khilwani, R., Donahue, C., Erdos, G., Falo Jr., L. D., Ozdoganlar, O. B., 2014, ‘Dissolvable microneedle arrays for intradermal delivery of biologics: fabrication and application’, *Pharmaceutical Research*, v.31(1), pp. 117-135.
38. Suphekar, S. D., Gozen, B. A., **Bediz, B.**, Ozdoganlar, O. B., Skerlos, S. J., 2013, ‘Feasibility of supercritical carbon dioxide based metalworking fluids in micromilling’, *Journal of Manufacturing Science and Engineering*, v.135(2), 024501.
39. Filiz, S., **Bediz, B.**, Romero, L. A., Ozdoganlar, O. B., 2012, ‘A spectral-Tchebychev solution for three-dimensional vibrations of parallelepipeds under mixed boundary conditions’, *Journal of Applied Mechanics*, v.79(5), 051012.

40. **Bediz, B.**, Kumar, U., Ozdoganlar, O. B., and Schmitz, T. L., 2012, ‘Modeling and experimental dynamics of three-dimensional dynamics of endmills’, *International Journal of Machine Tools and Manufacturing*, v.53(1), pp. 39-50.
41. **Bediz, B.**, Ozguven, H. N., and Korkusuz, F., 2009, ‘Vibration measurements predict the mechanical properties of tibia’, *Journal of Clinical Biomechanics*, v.25, pp. 365-371.

CONFERENCE
PUBLICATIONS

1. Simsek, U., Ozcevik, B., Soylemez, E., **Bediz, B.**, 2022, ‘Integration of Particle Dampers with Additive Manufacturing for Sustainable Aviation’, *Towards Sustainable Aviation Summit – TSAS2022*, October 18-20, France.
2. Ahmed, K. S., **Bediz, B.**, 2022, ‘Design of an Active Magnetic Bearing Spindle for Micro-Milling Applications’, *19th International Conference on Machine Design and Production*.
3. Shahabad, P. K., Anamagh, M. R., Serhat, G., Basdogan, I., **Bediz, B.**, 2022, ‘Design of variable stiffness composite plates using lamination parameter extrapolation and spectral-Chebyshev method’, *25th International Conference on Composite Structure*.
4. Shahabad, P. K., Anamagh, M. R., Serhat, G., Basdogan, I., **Bediz, B.**, 2022, ‘Multi-objective optimization of variable stiffness composite panels using lamination interpolation approach’, *International Conference on Nonlinear Solid Mechanics*.
5. Ozcevik, B., Simsek, U., **Bediz, B.**, Soylemez, E., 2022, ‘Tailoring Dynamic Behavior Of Additively Manufactured Structures With Particle Dampers’, *2nd Global Summit on 3D Printing & Additive Manufacturing (3DPrinting-2022)*.
6. Choupani, A., Temucin, E. S., **Bediz, B.**, 2022, ‘Structural Optimization, Design, and Fabrication of Dissolvable Microneedle Arrays’, *5th International Conference on Medical Devices*.
7. Dedeboy, D., **Bediz, B.**, Cigeroglu, E., 2022, ‘Nonlinear Vibration Analysis of Uniform and Functionally Graded Beams with Spectral Chebyshev Technique and Harmonic Balance Method’, *IMAC XL - International Modal Analysis Conference*.
8. Motlagh, P. L., Anamagh, M. R., **Bediz, B.**, Basdogan, I., 2021, ‘A spectral Tchebychev solution for electrostatic analysis of functionally graded composite plates with integrated piezo-patches’, *MECHCOMP7 - 7th International Conference on Mechanics of Composites*.
9. Shahabad, P. K., Anamagh, M. R., **Bediz, B.**, 2021, ‘Buckling analysis of laminated composite panels using 2D spectral Chebyshev and lamination parameters’, *24th ICCS - International Conference on Composite Structures*.
10. Anamagh, M. R., **Bediz, B.**, 2019, ‘Three dimensional dynamics of laminated curved composite structures: A spectral-Tchebychev solution’, *14th International Conference on Vibration Problems*, Crete, Greece.
11. Anamagh, M. R., **Bediz, B.**, 2019, ‘Prediction of three-dimensional static and dynamic behavior of laminated composite structures having variable curvature’, *5th International Conference on Mechanics of Composites*, Lisbon, Portugal.
12. Anamagh, M. R., **Bediz, B.**, 2019, ‘Three-Dimensional Vibration Behavior of FGM Doubly-Curved Laminated Structures’, *37th International Modal Analysis Conference*, Orlando, Florida, USA.
13. **Bediz, B.**, Ozdoganlar, O. B., 2018, ‘Predicting the rotating tool-tip dynamics in mechanical micromachining using modal testing’, *International Congress on Machining*, Antalya, Turkey.
14. **Bediz, B.**, 2018, ‘Effects of the rotational speed on the dynamics of micro-cutting tools’, *18th International Conference on Machine Design and Production*, Eskisehir, Turkey.

15. Korkmaz, E., Gozen, **B. A.**, **Bediz, B.**, Ozdoganlar, O. B. 2015, ‘High-Frequency Compensation of Dynamic Distortions in Micromachining Force Measurements’, *Procedia Manufacturing: North American Manufacturing Research Conference*, v.1, pp. 534-545.
16. **Bediz, B.**, Ozdoganlar, O. B., 2015, ‘Modeling three-dimensional dynamics of rotating micro endmills including attachment errors’, *International Conference on Micromanufacturing*.
17. Hao, B., Korkmaz, E., **Bediz, B.**, Ozdoganlar, O. B., 2014, ‘A novel test artifact for performance evaluation of additive manufacturing processes’, *American Society for Precision Engineering Conference*.
18. Korkmaz, E., **Bediz, B.**, Gozen, B. A., Ozdoganlar, O. B., 2014, ‘Accurate measurement of micromachining forces through high frequency correction of multi-axis dynamometers’, *Proceedings of International Conference on Micromanufacturing*.
19. Korkmaz, E., **Bediz, B.**, Gozen, B. A., Ozdoganlar, O. B., 2013, ‘Force measurement characteristics of multi-axis dynamometers’, *North American Manufacturing Research Conference*.
20. Korkmaz, E., **Bediz, B.**, Khilwani, R., Erdos, G., Falo Jr., L. D., Ozdoganlar, O. B., 2013, ‘A novel technique for fabrication of dissolvable microneedle arrays’, *7th International Conference on Microtechnologies in Medicine and Biology*.
21. Hao, B., Korkmaz, E., **Bediz, B.**, Ozdoganlar, O. B., 2013, ‘Geometric qualification of polymer micro and meso-scale features fabricated by UV-based additive manufacturing’, *International Conference on Micromanufacturing*.
22. **Bediz, B.**, Korkmaz, E., Ozdoganlar, O. B., 2013, ‘An impact exScholar citation system for repeatable, high-bandwidth modal testing of miniature structures’, *IMAC-XXXI Conference & Exposition on Structural Dynamics*.
23. **Bediz, B.**, Korkmaz, E., Gozen, B. A., Ozdoganlar, O. B., 2012, ‘Dynamic characterization of a miniature ultra-high-speed (UHS) spindle through experimental modal analysis’, *Proceedings of the 12th International euspen conference*, June 4-8, Stockholm, Sweden.
24. Korkmaz E., **Bediz, B.**, Gozen, B. A., Ozdoganlar, O. B., 2012, ‘Identification of dynamometer dynamics for accurate measurement of micro-cutting forces,’ *Proceedings of International Conference on Micromanufacturing*, Northwestern University, IL, March 12-14.
25. **Bediz, B.**, Kumar, U., Ozdoganlar, O. B., Schmitz, T. L., 2011, ‘Three-dimensional endmill dynamics: Modal development and experimental validation’, in *Proc. of the ASME, 2011 International Manufacturing Science and Engineering Conference*, Corvallis, OR, June 13-17, 111-118.
26. Khilwani, R., **Bediz, B.**, Long, G. A., Ozdoganlar, O. B., 2011, ‘Micromachining of polymers’, *Proceedings of International Conference on Micromanufacturing*, Japan.
27. **Bediz, B.**, Ozguven, H. N., Korkusuz, F., 2008, ‘Measuring structural dynamic properties of human tibia by modal testing’, *Proceedings of the 26th International Modal Analysis Conference*, Orlando, Florida, February.

INVITED TALKS AND PRESENTATIONS

1. ‘Kompozit Yapıların Üç Boyutlu Dinamik Davranışının Yüksek Doğrulukla Tahmini’, Istanbul Technical University, March 2019, Istanbul, Turkey.
2. ‘Mechanical micro-manufacturing and its applications on biomedical systems’, Turkey-Taiwan Health Science Symposium, April 2018, Ankara, Turkey.
3. (Keynote), ‘A novel fabrication technique for dissolvable microneedle arrays’, 8th National Biomechanics Congress, October 2016, Ankara, Turkey.

GRANT
PROPOSALS

1. 'Mikro frezeleme icin aktif manyetik yataklı ultra yüksek hızlı is, mili tasarımını ve optimizasyonu', PI: **Bediz B.**, TÜBİTAK, 1002 Short Term R&D Funding Program. (2023 - 2024)
2. 'Takviye Yapılarla Güçlendirilmiş Katmanlı Kompozit Panellerin Analizi ve Çok Amaçlı Tasarımı İçin Yenilikçi Spektral Eleman Yöntemi Geliştirilmesi', PI: **Bediz B.**, TÜBİTAK, 1001 The Scientific and Technological Research Projects Funding Program. (2023 - 2026)
3. 'Laminasyon/Katman Parametre İnterpolasyon Yöntemine Dayalı Spektral Modelleme Yaklaşımı Kullanılarak Üretilabilir, Değişken Sertlikte Kompozit Plakaların Tasarımının Çok Amaçlı Eniyilenmesi', PI: **Bediz B.**, TÜBİTAK, 1001 The Scientific and Technological Research Projects Funding Program. (2021 - 2023)
4. 'HPC Competency Centers', Araştırmacı: **Bediz B.**, H2020-JTI-EuroHPC. (2020-2022)
5. 'Biyoçözünür Polimer Tabanlı Mikro-İğne Dizisi Geliştirilmesi ve Karakterizasyonu: İntradermal Glukozaminoglikan (Gag), Kondroitin Sülfat (Cs) Ve Hyaluronan Aktarımı Teknolojik Platformu', PI: **Bediz B.**, TÜBİTAK, 1005 National New Ideas And New Products Research Funding Program. (November 2020 - July 2022)
6. 'Kompozit yapıların üç boyutlu gerilme, burkulma ve dinamik davranışının yüksek doğruluklu ve hesaplamalı olarak verimli tahmini için yeni bir spektral modelleme yaklaşımının geliştirilmesi ve kompozit yapı tasarımını eniyilemesi', PI: **Bediz B.**, TÜBİTAK, 3501 Career Development Program (CAREER). (November 2018 - September 2021)
7. 'Yapıların Yüksek Doğruluklu Modal Analizi İçin Otomatik Darbe Tahrik Sistemi Geliştirilmesi', PI: **Bediz B.**, TÜBİTAK, 3001 Starting R&D Projects Funding Program. (September 2017 - August 2019)
8. 'Karmaşık Dinamik Yapıların Spektral-Tchebychev Tekniği ile Modellenmesi ve Yapısal Özelliklerinin Hesaplanması', PI: **Bediz B.**, TÜBİTAK, 2232 Yurda Dönüş Araştırma Burs Programı. (September 2016 - August 2018)

PATENTS

1. 'Yapı Analizinde Kullanılmaya Uygun Bir Darbe Tahrik Sistemi', TR 2020 05454 A1.

TEACHING
EXPERIENCE

Faculty Member in Sabancı University

ENS204 Mechanics

ENS214 Dynamics

ME302 Mechanical Systems II

ME405/505 Mechanical Vibrations

ME408 Mechatronics Engineering Design

ME580 Advanced Vibrations

CS409 Introduction to Scientific Computing

2016 Summer: Lecturer in TOBB University of Economics and Technology

MAK310 Numerical Methods

2015 Fall: Lecturer in Middle East Technical University

ME212 Principles of Production Engineering

REFEREE SERVICE **Journal of Manufacturing Science and Engineering**
Journal of Sound and Vibration
Journal of Intelligent Material Systems and Structures
Journal of Biomechanics
AIAA Journal
CIRP Annals
International Journal of Mechanical Sciences
International Journal of Solids and Structures
The International Journal of Advanced Manufacturing Technology
Journal of Sensors
Mechanical Systems and Signal Processing
Journal of Materials Processing Technology
Multidiscipline Modeling in Materials and Structures
Materials
Composite Structures

FELLOWSHIPS &
HONORS

- Marie Skłodowska-Curie Actions Seal of Excellence, 2018
- Marie Skłodowska-Curie Actions Seal of Excellence, 2017
- Outstanding Reviewer Award, Journal of Sound and Vibration (Elsevier), 2016
- Carnegie Mellon University, Graduate Student Organization Conference Funding, 2013
- John and Claire Bertucci Fellowship, Carnegie Mellon University, 2012
- Doctorate Research Fellowship, Carnegie Mellon University, 2009–2015
- Middle East Technical University, Graduate Courses Performance Award, 2007
- 1st rank in Izocam Insulation (HVAC) competition, 2006
- Graduate Fellowship of Scientific and Technical Research Council of Turkey (TUBITAK), 2006
- Graduation with the 5th rank in the department (out of 293 students), 2006
- Deans High Honor Certificates, 2002-2006

HARDWARE &
SOFTWARE SKILLS

- **Programming Languages:** MATLAB, MathCad, Labview, C#, Python
- **CAD Software:** Solidworks
- **Finite Element Analysis Packages:** ANSYS, COMSOL
- **Productivity Applications:** TeX(LaTeX, BiBTeX), MS Office (Word, Excel, Powerpoint), Adobe Illustrator, Adobe Photoshop
- **Measurement systems & Instrumentation:** Laser Doppler Vibrometry (LDV), Scanning Electron Microscopy, National Instruments PXI devices, Impact hammer testing equipment