Prof. Dr. Sezer SORGUN, Ph.D.

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Academic Biography

🔖 I was born in 1979 in Kayseri, Turkey. During my undergraduate studies, I taught mathematics at various schools and educational institutions. Following the completion of my undergraduate degree, I served as a research assistant at Gazi University. In 2007, I transitioned to the Turkish Statistical Institute, where I worked as a mathematician in the Household Research Department.

After earning my PhD in 2011, I was appointed as an assistant professor in 2012 and currently hold the position of full professor at the same institution. Additionally, I was awarded a TUBITAK (The Scientific and Technological Research Council of Turkey) scholarship under Project Code 1059B191700075, which enabled me to conduct post-doctoral research at Sungkyunkwan University in South Korea from 2012 to 2013. Following a subsequent successful application to the same program (Project Code 1059B191200298), I undertook a second post-doctoral fellowship at the University of Delaware, USA, in 2018. During this period, I was also appointed as an adjunct faculty member in the Department of Mathematics, where I taught a course in Discrete Mathematics during the Fall 2018 semester. My research focuses on mathematics, particularly spectral graph theory and matrix theory, areas in which I continue to actively contribute. On a personal note, I am married and have two children.

Fields of Research

- 🔖 *Discrete Mathematics*
- 🔖 *Matrix Theory*
- 🔖 *Spectra of Graphs*
- 🔖 *Chemical Graphs*
- 🔖 *Combinatorial inequalities*
- 🔖 *Algebra*

Education

2007 – 2011	🔖 **Ph.D. Department of Mathematics** in Erciyes University. Thesis title: *Bounds for the spectral radius of weighted graphs.*
2002 – 2005	🔖 **M.Sc. Department of Mathematics** in Gazi University. Thesis title: *Invariant Subspaces in Banach Lattices.*
1998 – 2002	🔖 **B.Sc. Department of Mathematics** in Erciyes University.

Employment History

2003 – 2006	🔖	**Research Assistant,** Gazi University, Ankara/TURKEY.
2007 – 2012	🔖	**Mathematician,** Turkish Statistical Institute, Ankara/TURKEY
2012 – 2015	🔖	**Assistant Professor,** Nevşehir Hacı Bektaş Veli University, Nevşehir/TURKEY.
2013 – 2014	🔖	**PosDoc/Researcher,** Sungyunkwan University, Suwon/SOUTH KOREA.
2015 – 2021	🔖	**Associated Professor,** Nevşehir Hacı Bektaş Veli University, Nevşehir/TURKEY.
2018 – 2019	🔖	**Visiting Scientist/Adjunt Faculty,** University of Delaware, Newark/ USA.
2021 – still	🔖	**Full Professor,** Nevşehir Hacı Bektaş Veli University, Nevşehir/TURKEY.

Administrative Tasks

2015 – 2017	🔖	**Board Member,** Education Faculty, Nevşehir Hacı Bektaş Veli University.
2015 – 2019	🔖	**Board Member,** Avanos Vocational School, Nevşehir Hacı Bektaş Veli University.
2015 – 2018	🔖	**Chairman,** Department of Statistics, Nevşehir Hacı Bektaş Veli University.
2017 – 2020	🔖	**Senator,** Nevşehir Hacı Bektaş Veli University.
2016 – 2022	🔖	**Deputy of Chairman,** Department of Mathematics, Nevşehir Hacı Bektaş Veli University.
2015 – still	🔖	**Chairman of Head of Algebra and Number Theory,** Nevşehir Hacı Bektaş Veli University.
2022 – still	🔖	**Chairman,** Department of Mathematics, Nevşehir Hacı Bektaş Veli University.

Thesis/Postdoctoral Advisory

M.Sc.

2014	🔖	**Kahraman Birgin**, *Energies of Directed (Undirected) Graphs.*
2016	🔖	**Bahar Kuloğlu**, *Consta-cyclic codes.*
2017	🔖	**Hakan Küçük**, *Algebraic connectivity of graphs.*
	🔖	**Duygu Sazak**, *Seidel Energy of Graphs.*
	🔖	**Hatice Pınar Cantekin**, *Laplacian spectral properties of nilpotent graphs on integer rings.*
2018	🔖	**Aysun Başbuğ**, *Nordhaus-Gaddum type bounds for laplacian and signless laplacian eigenvalues of graphs.*
2019	🔖	**Zekiye Yazar**, *The bounds of Nordhaus-Gaddum type for spectral radius of graphs.*
2023	🔖	**Esma Elyemani**, *Eccentric graph of a graph and its structural properties.*
2024	🔖	**Akkız Çelik**, *Algebraic properties of total graphs.*
	🔖	**Selma Sucu**, *Sombor indices of graphs and their bounds.*

PH.D.

2016	🔖	**Hatice Topcu**, *Graph isomorphism and cospectral graphs.*
2019	🔖	**Neriman Kartal**, *On graphs with the same Randic energy.*
2022	🔖	**Hakan Küçük**, *The eccentricity matrix of graphs and its spectra.*
2023	🔖	**Hatice Pınar Cantekin**, *On some algebraic structures of the graphs.*
	🔖	**Zafer Öztürk**, *Some mathematical modeling of fractional order differential equations.* (2nd advisor)

Thesis/Postdoctoral Advisory (continued)

🔖 **Ali Gökhan Ertaş**, *Circular and octographic graphs in point-line geometry* (2nd advisor)

2024 🔖 **Kahraman Birgin**, *Topological indices of graphs and chemical applications.*

PostDoc

2025 🔖 **M.J. Nadjafi Arani**, Title of Project, *"Distance in Graphs and Its Applications in Computer Sciences".*

🔖 **Mahsa Mirzargar**, Title of Project, *"Finite Groups With The Same Enhanced Power Graph"*

Research Projects

2014 🔖 *"Examination of the automatically obtained bounds for the largest Laplacian eigenvalues of the graphs"*, Project Manager, 2012-2013, Supported by Nevşehir Hacı Bektaş Veli University.

2016 🔖 *"Graph isomorphism and cospectral graphs"*, Project Manager, 2014-2015, Supported by Nevşehir Hacı Bektaş Veli University.

🔖 *"On m-extensions of Fibonacci Function with k period"*, Researcher Position, 2016, Supported by Nevşehir Hacı Bektaş Veli University.

2020 🔖 *"Classification of graphs with all but three eigenvalues different from -1 or 0"*, Supervisor position, 2018-2020, Supported by TUBITAK (the Scientific and Technological Research Council of Turkey).

Research Publications

Journal Articles

1. S. Sorgun and K. Birgin, "Vertex-edge-weighted molecular graphs: A study on topological indices and their relevance to physicochemical properties of drugs used in cancer treatment," *Journal of Chemical Information and Modeling*, vol. 65, no. 4, pp. 2093–2106, 2025.

2. Z. Öztürk, H. Bilgil, and S. Sorgun, "A new application of fractional glucose-insulin model and numerical solutions," *Sigma Journal of Engineering and Natural Sciences*, vol. 42, no. 2, pp. 407–413, 2024.

3. Z. Öztürk, A. Yousef, H. Bilgil, and S. Sorgun, "A fractional-order mathematical model to analyze the stability and develop a sterilization strategy for the habitat of stray dogs," *An International Journal of Optimization and Control*, vol. 14, no. 2, pp. 134–146, 2024.

4. S. Sorgun and E. Elyemani, "On the eccentric graph of trees," *Ars Combinatoria*, vol. 159, no. 6, pp. 87–93, 2024.

5. S. Sorgun and A. G. Ertas, "A unified approach to the incidence graphs of (weak) generalized quadrangles," *Journal of Discrete Mathematics and Its Applications*, vol. 9, no. 1, pp. 65–72, 2024.

6. S. Sorgun, A. G. Ertas, and İ. Gunaltılı, "On the incidence graph of circular spaces," *Electronic Journal of Graph Theory and Applications*, vol. 12, no. 2, pp. 379–386, 2024.

7. N. Batır, S. Sorgun, and S. Atpınar, "On some binomial coefficient identities with applications," *Journal of Integer Sequences*, vol. 26, no. 2, p. 3, 2023.

8. H. P. Cantekin and S. Sorgun, "On analogues of nilpotent and total graphs associated ring," *Journal of Sivas Cumhuriyet Science and Technology*, vol. 2, no. 1, pp. 1–4, 2023.

9. Z. Öztürk, H. Bilgil, and S. Sorgun, "Application of fractional SPR psychological disease model in turkey and stability analysis," *Journal of Mathematical Sciences and Modelling*, vol. 6, no. 2, pp. 49–55, 2023.

[10] Z. Öztürk, H. Bilgil, and S. Sorgun, "Fractional siqrv model for covid-19 and numerical solutions," *Konuralp Journal of Mathematics*, vol. 11, no. 2, pp. 131–140, 2023.

[11] S. Sorgun and H. Küçük, "On two problems related to anti-adjacency (eccentricity) matrix," *Discrete Applied Mathematics*, vol. 328, pp. 1–9, 2023.

[12] J. Wang, X. Lei, M. Lu, S. Sorgun, and H. Küçük, "On graphs with exactly one anti-adjacency eigenvalue and beyond," *Discrete Mathematics*, vol. 346, no. 6, p. 113 373, 2023.

[13] Z. Öztürk, H. Bilgil, and S. Sorgun, "Stability analysis of fractional psq p smoking model and application in turkey," *New Trends in Mathematical Sciences*, vol. 10, no. 4, pp. 54–62, 2022.

[14] S. Sorgun, H. Küçük, and K. Birgin, "Some distance-based topological indices of certain polysaccharides," *Journal of Molecular Structure*, vol. 1250, p. 131 716, 2022.

[15] N. Batır, H. Kucuk, and S. Sorgun, "Convolution identities involving the central binomial coefficients and catalan numbers," *Transactions on Combinatorics*, vol. 10, no. 4, pp. 225–238, 2021.

[16] H. Küçük and S. Sorgun, "On some classes of series representations for $1/\pi$ and π^{2}," *Mathematical Sciences and Applications E-Notes*, vol. 9, no. 4, pp. 176–184, 2021.

[17] Z. Öztürk, S. Sorgun, H. Bilgil, and Ü. Erdinç, "New exact solutions of conformable time-fractional bad and good modified boussinesq equations," *Journal of New Theory*, no. 37, pp. 8–25, 2021.

[18] W. H. Haemers, S. Sorgun, and H. Topcu, "On the spectral characterization of mixed extensions of p3," *Electronic Journal of Combinatorics*, vol. 26, no. 3, P3–16, 2019.

[19] S. Sorgun, H. Küçük, and N. Kartal, "Some results on constructing of graphs which have the same randić energy," *MATCH-Communications in mathematical and in computer chemistry*, vol. 81, pp. 443–458, 2019.

[20] H. Topcu, S. Sorgun, and W. H. Haemers, "The graphs cospectral with the pineapple graph," *Discrete Applied Mathematics*, vol. 269, pp. 52–59, 2019.

[21] S. Sorgun and H. Topcu, "On the laplacian eigenvalues of the kite graph," *Anadolu University Journal of Science and Technology B-Theoretical Sciences*, vol. 6, no. 1, pp. 1–7, 2018.

[22] H. Topcu and S. Sorgun, "The kite graph is determined by its adjacency spectrum," *Applied Mathematics and Computation*, vol. 330, pp. 134–142, 2018.

[23] S. Sorgun, "An incomparable upper bound for the largest laplacian graph eigenvalue," *ARS Combinatoria*, vol. 133, pp. 197–204, 2017.

[24] S. Sorgun and H. P. Cantekin, "Laplacian spectral properties of nilpotent graphs over ring $_n$," *Sakarya University Journal of Science*, vol. 21, no. 2, pp. 1443–1447, 2017.

[25] S. Sorgun, H. Sopcu, K. Birgin, and H. Küçük, "Some relations among the largest eigenvalues of product matrix and graph matrices," *Journal of Nevşehir Science and Technology*, vol. 4, no. 2, pp. 26–34, 2016.

[26] S. Sorgun and H. Topcu, "On the spectral characterization of kite graphs," *Journal of Algebra Combinatorics Discrete Structures and Applications*, vol. 3, no. 2, pp. 81–90, 2016.

[27] H. Topcu, S. Sorgun, and W. H. Haemers, "On the spectral characterization of pineapple graphs," *Linear Algebra and its Applications*, vol. 507, pp. 267–273, 2016.

[28] K. Das, S. Sorgun, and I. Gutman, "On randić energy," *MATCH-Communications in mathematical and in computer chemistry*, vol. 73, no. 1, pp. 81–92, 2015.

[29] K. Das and S. Sorgun, "On randic energy of graphs," *MATCH-Communications in mathematical and in computer chemistry*, vol. 72, no. 1, pp. 227–238, 2014.

[30] S. Sorgun, Ş. Büyükköse, and H. Özarslan, "An upper bound on the spectral radius of weighted graphs," *Hacettepe Journal of Mathematics and Statistics*, vol. 42, no. 5, pp. 517–524, 2013.

31   S. Sorgun, "Bounds for the largest laplacian eigenvalue of weighted graphs," *International Journal of Combinatorics*, vol. 2013, no. 1, p. 520 610, 2013.

32   S. Sorgun and Ş. Büyükköse, "On the bounds for the largest laplacian eigenvalues of weighted graphs," *Discrete Optimization*, vol. 9, no. 2, pp. 122–129, 2012.

33   S. Sorgun and Ş. Büyükköse, "The new upper bounds on the spectral radius of weighted graphs," *Applied Mathematics and Computation*, vol. 218, no. 9, pp. 5231–5238, 2012.

34   S. Sorgun, "The comparison of upper bounds for spectral radius of weighted graphs," *Int. J. Algebra*, vol. 5, pp. 1567–1574, 2011.

35   Ş. Büyükköse and S. Sorgun, "A bound on the spectral radius of a weighted graph," *Gazi University Journal of Science*, vol. 22, no. 4, pp. 263–266, 2009.

Conference Proceedings

1   S. Sorgun, "The eccentricity matrix of graphs and its properties," in *Algebraic Combinatorics Workshop 2022*, Konya, Turkey, 2022.

2   H. Topcu and S. Sorgun, "On the graphs with all but at most three eigenvalues equal to -1 and 0," in *Workshop on Graph Spectra, Combinatorics and Optimization*, Portugal, 2018.

3   S. Sorgun, H. Topcu, and H. Küçük, "Some problems in spectral graph theory," in *13th Algebraic Hyperstructures and its Applications*, İstanbul, Turkey, 2017.

4   H. Topcu and S. Sorgun, "Kite graph is determined by its adjacency spectrum," in *International Conference on Mathematics and Engineering*, İstanbul, Turkey, 2017.

5   H. Topcu and S. Sorgun, "On the spectral characterization of the pineapple graph," in *International Conference on Mathematics and Engineering*, İstanbul, Turkey, 2017.

6   H. Topcu, S. Sorgun, and H. P. Cantekin, "Laplacian spectral properties of nilpotent graphs over ring zn," in *International Conference on Mathematics and Engineering*, İstanbul, Turkey, 2017.

7   H. Topcu, S. Sorgun, and H. Küçük, "On trees which have four non zero randic eigenvalue," in *13th Algebraic Hyperstructures and its Applications*, İstanbul, Turkey, 2017.

8   S. Sorgun, "On laplacian spectrum of the nilpotent graphs over the ring zn," in *Spectra of graphs and applications*, Belgrad, Serbia, 2016.

9   K. Birgin and S. Sorgun, "Graph energy and some open problems," in *Karatekin Mathematics Days*, Çankırı, Turkey, 2014.

10   S. Sorgun and H. Topcu, "On the spectral determination some special graph," in *Antalya Algebra Days*, Antalya, Turkey, 2014.

11   H. Topcu and S. Sorgun, "Graph determination by adjacency spectrum," in *Karatekin Mathematics Days*, Çankırı, Turkey, 2014.

12   S. Sorgun, "Spectral properties of the laplacian matrix of long kite graphs," in *2nd Workshop on Spectral Graph Theory and Related Topics*, Tohoku, Japan, 2013.

13   S. Sorgun, H. Küçük, K. Birgin, and H. Topcu, "About some conjecture bounds for the largest laplacian eigenvalue of graphs," in *Proceedings of the, 4th International Conference on Matrix Analysis and Applications (ICMAA 2013)*, Konya, Turkey, 2013.

14   S. Sorgun and H. Topcu, "On the spectral characterization of wheel graphs," in *Proceedings of the, 4th International Conference on Matrix Analysis and Applications (ICMAA 2013)*, Konya, Turkey, 2013.

15   Ş. Büyükköse, A. D. Maden, and S. Sorgun, "The bounds for spectral radius using product matrix of g graph," in *Conference on Matrix Analysis and Appl., MatTriad. (ICMAA 2011)*, Tomar, Portugal, 2011.

16 S. Sorgun, "Spectral radius of a weighted graph," in *Karatekin Mathematics Days (ICMAA 2011)*, Çankırı, Turkey, 2011.

Books and Chapters

1 K. Das, S. Sorgun, and K. Xu, "On randic energy of graphs," in *Energies of Graphs -Theory and Applications*, I. Gutman and X. Li, Eds., University of Kragujevac, 2016, pp. 23–26.

Courses

Undergraduate Level

- *Linear Algebra*
- *Abstract Algebra*
- *Number Theory*
- *Discrete Mathematics*
- *Abstract Mathematics and Logic*
- *Introduction of Research*

Graduate Level

- *Group Theory*
- *Graph Theory*
- *Combinatorics*
- *Spectral Graph Theory*
- *Matrix Analysis*

Postgraduate Level

- *Ring Theory*
- *Graph Energies*
- *Scientific Research and Publication Ethics*

Miscellaneous Experience/Activities

2018 *Lecture Book*, Editor of "12th grade basic mathematics", Turkish Ministry of Education Publications, 2018. ISBN 978-975-11-4604-5.

2015 *Staff Mobility*, ERASMUS, Universitatea Ovidius Constanta, Department of Mathematics, 1-6/06/2015, ROMANIA.

2017 *Staff Mobility*, ERASMUS, Konstantin Preslavsky University of Shumen, Department of Mathematics, 14-20/05/2017, BULGARIA

2023 *Staff Mobility*, ERASMUS, University of Niś, Department of Mathematics, 24-29/04/2023, SERBIA.

2024 *Award*, Researcher Award for the Most Publications in 2024 at the Academic Performance Award Ceremony