Hussein F. Al-Taani, Ph.D.

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Research metrics
(Google Scholar, Oct. 2026)
Citations: 3,823
h-index: 30 i10-index: 42

Philosophy Statement: Teaching, Research, and Service

Throughout my academic career, I have come to see teaching, research, and service not as separate tasks, but as parts of a larger mission: helping students grow, contributing meaningful knowledge to my field, and supporting the academic community around me.

Teaching Philosophy

I believe learning should be engaging, relevant, and empowering. In my classroom, I aim to connect theory with real-world practice, especially in physics and mathematics, which can often feel abstract to students. I use hands-on tools like PocketLab, digital simulations, and project-based learning to bring these concepts to life. Whether I am teaching physics or mathematics courses, my goal is to create an inclusive, student-centered environment where everyone feels encouraged to think critically and apply what they learn. Over the years, I have been honored to receive recognition for my teaching, but the greatest reward continues to be seeing students grow in confidence and capability.

Research Philosophy

My research is driven by curiosity and a desire to solve real problems. I focus on applied physics and materials science, as well as physics education and applied mathematics. I believe that research should not only contribute to scientific advancement but also support community needs and sustainable development. I enjoy working on interdisciplinary projects and collaborating across institutions and countries. For me, research is not just about publishing papers (though I value that too); it is about contributing something useful to science and society. I have been fortunate to lead several funded projects, including those that bridge research with education. I also value mentoring students in research and helping them discover their own academic passions.

Service Philosophy

Service is where teaching and research meet community. I have served on many committees, from curriculum and promotion to disciplinary and hiring, and I take this work seriously. I believe that universities function best when faculty are active participants in shaping their institutions. I have also been involved in outreach efforts, such as mentoring high school students, helping improve university-level exam systems, hosting visiting researchers, participating in organizing scientific conferences, and participating in international collaboration through programs like Erasmus+. In everything I do, whether teaching in the classroom, writing research, or serving the university, I am guided by a simple principle: to make a positive and lasting impact. I am committed to continuing this work with integrity, enthusiasm, and a deep respect for the role of education in shaping both individuals and society.

Education

2010	Ph.D. in Physics, New Mexico State University (NMSU), Las Cruces, NM, USA.
2005	M.Sc. in Physics, Jordan University of Science and Technology (JUST), Irbid, Jordan.
2002	B.Sc. in Applied Physics, Jordan University of Science and Technology (JUST), Irbid, Jordan.

Academic Ranks and Employment

Nov. 2025 – Present	**Professor**, Basic Sciences Department, German Jordanian University (promoted 24 November 2025).
Oct. 2023 – Sep. 2025	Sabbatical leave as Associate Professor, Al Hussein Technical University (HTU), Amman, Jordan.
Apr. 2018 – Nov. 2025	Associate Professor, German Jordanian University.
Jan. 2011 – Apr. 2018	Assistant Professor, German Jordanian University.
Jul. 2015 – Aug. 2015	Visiting Researcher, Leibniz-Institut für Analytische Wissenschaften (ISAS), Dortmund, Germany.
May 2009 – Dec. 2010	Graduate Research Assistant (funded by NMSU), Brookhaven National Laboratory (BNL), NY, USA.
Apr. 2008 – Apr. 2009	Graduate Research Assistant (funded by NMSU), Los Alamos National Laboratory, NM, USA.
Jan. 2006 – Apr. 2008	Graduate Teaching Assistant, Physics Department, New Mexico State University.
Jan. 2005 – Jan. 2006	Laboratory Instructor, Physics Department, Jordan University of Science and Technology.
Jan. 2003 – Dec. 2004	Graduate Teaching and Research Assistant, Physics Department, Jordan University of Science and Technology.

Administrative Positions

Sep. 2025 – Sep. 2026	Member of the School Council, School of Computing, German Jordanian University.
Jul. 2019 – Sep. 2020	Vice Dean, School of Basic Sciences and Humanities, German Jordanian University.
Oct. 2013 – Feb. 2015	Assistant Dean, School of Natural Resources Engineering and Management, German Jordanian University.

Research and Funded Projects

Ongoing Funded Research Projects (since 2025)

- **"Using PocketLab to Improve Project-Based Learning in Functional Physics at HTU"**, funded by the Deanship of Scientific Research and Innovation, Al Hussein Technical University (HTU).
  Role: PI.
  Objectives: To enhance physics education at HTU by integrating PocketLab into project-based

learning (PBL). Using PocketLab's real-time data collection and interactive experiments, students develop critical thinking, problem-solving skills, and a deeper understanding of physics concepts.

- **"Advancing Combinatorial-Based Modulation via Kirkman Designs in Massive MIMO Systems"**, funded by the Deanship of Scientific Research, German Jordanian University. *Role:* Co-PI. *Objectives:*
  - Develop scalable, low-complexity modulation techniques suitable for ultra-massive MIMO systems.
  - Improve spectral efficiency and reduce bit error rates through structured modulation schemes.
  - Enable better resource allocation and interference mitigation, which are critical for high-density wireless environments (e.g., smart cities, IoT, and Industry 4.0).

Completed Research Projects (2016–2018)

- **"Electrical Characterization of Photovoltaic Materials"**, funded by German Jordanian University. *Role:* PI.
  Objectives: Determining and characterizing the electrical and optical properties of materials used in PV cells.
- **"Excellence in Nanoscience Education for the MENA Region (XNEM)"**, funded by EU-TEMPUS. *Role:* Co-researcher.
  Objectives: Development of a regional M.Sc. in Nanoscale Science and Engineering for Arab postgraduate students.
- **"Biogas Production in Local Communities in Jordan"**, funded by the EU. *Role:* Co-researcher. *Objectives:*
  - To promote the production of biogas energy from organic waste in Jordan.
  - To develop a hybrid biogas plant design (industrial scale) for agricultural and food waste in local communities.
- **"Efficiency and Design of PV Systems in the Jordan Valley"**.
  Objectives:
  - Development and evaluation of methods to increase the efficiency of PV arrays.
  - Definition of an optimized sizing procedure for PV arrays in the Jordan Valley.
  - Prediction of the effects of environmental and local weather conditions on PV system performance.

Research Interests and Other Activities

- Fractional-order discrete dynamical systems: chaos, synchronization, and control.
- Matrix and network methods for biological systems.
- Radiation shielding materials (gamma and neutron attenuation).
- Renewable energy systems (photovoltaics, wind, thermoelectric harvesting).
- Experimental techniques to improve student understanding of physical concepts in magnetism and renewable energy.
- Application of boron-doped diamond (BDD) in wastewater treatment.
- *Ab initio* calculations of high-pressure phase transitions.
- Experimental high-energy nuclear physics (PHENIX Collaboration, BNL).

Courses Taught

German Jordanian University

- General Physics I (Mechanics).
- General Physics II (Electricity and Magnetism).
- General Physics Laboratory I (Mechanics, Electricity and Magnetism).
- Applied Mathematics for Engineers.
- Physics for Architects (basics of mechanics, electrostatics and electricity, light, geometric optics, sound, heat transfer, climatology, gases and vapor).
- Introduction to Radiation Physics (undergraduate Water and Environmental Engineering).
- Radioactive Waste Management and Radiation Control (undergraduate Water and Environmental Engineering).

Al Hussein Technical University (Academic Years 2023/2024 and 2024/2025)

- Functional Physics.
- Functional Math.

Publications

Journal Articles

1. **H. Al-Taani**, M. Abudayah, W. A. Al-Zyoud, and I. Abushaikha, "Using matrix analysis to understand competition in food webs and antimicrobial resistance networks," *Royal Society Open Science* **13**(9) (2026).
2. **H. Al-Taani** and M. Kh. Hamad, "Enhanced radiation shielding performance of novel glass compositions: A comprehensive analysis of gamma and neutron attenuation properties," *Radiation Physics and Chemistry* **237** (2025) 112987.
3. E. A. M. Farrag, M. Kh. Hamad, A. M. Ali, A. M. Abdelmonem, and **H. Al-Taani**, "Unveiling the shielding potential: Exploring photon and neutron attenuation in a novel lead-free XCr_2Se_4 chalcogenide spinel alloys with MCNP 4C code," *Radiation Physics and Chemistry* **226** (2025) 112337.
4. **H. Al-Taani**, M. Abu Hammad, M. Abudayah, L. Diabi, and A. Ouannas, "On fractional discrete memristive model with incommensurate orders: Symmetry, asymmetry, hidden chaos and control approaches," *Symmetry* **17**(1) (2025) 143.
5. **H. Al-Taani**, M. Abu Hammad, O. Alomari, I. Bendib, and A. Ouannas, "Finite-time control of the discrete Sel'kov–Schnakenberg model: Synchronization and simulations," *AIP Advances* **15**(2) (2025).
6. M. Ziane, **H. Al-Taani**, M. A. Abudayah, O. Zentar, and M. Abu Hammad, "Langevin fractional system driven by two ψ-Caputo derivatives with random effects," *European Journal of Pure and Applied Mathematics* **18**(1) (2025) 5605.
7. **H. Al-Taani**, M. Abu Hammad, M. Abudayah, L. Diabi, and A. Ouannas, "Asymmetry and symmetry in new three-dimensional chaotic map with commensurate and incommensurate fractional orders," *Symmetry* **16**(11) (2024) 1447.
8. H. H. Abu-Safe, R. Al-Esseili, **H. Al-Taani**, H. El-Nasser, M. Refaei, M. Sarollahi, R. Alhelais, M. Zamani-Alavijeh, and M. E. Ware, "The nonlinear optical properties of nickel nano-films in the cw regime: Proposed model," *Optical Materials* **121** (2021) 111531.

9. R. Ramirez-Vazquez, S. Arabasi, **H. Al-Taani**, S. Sbeih, J. Gonzalez-Rubio, et al., "Georeferencing of personal exposure to radiofrequency electromagnetic fields from Wi-Fi in a university area," *International Journal of Environmental Research and Public Health* **17**(6) (2020) 1898.

10. Z. M. Dalala, Z. S. Hamdan, **H. Al-Taani**, M. Al-Addous, and A. Albatayneh, "Battery charging application with thermoelectric generators as energy harvesters," *The Academic Research Community Publication (ARChive-SR)* **3**(1) (2019) 248–259.

11. **H. Al-Taani**, M. Al-Addous, Z. Dalalah, A. Albatayneh, and N. Ayoub, "A simplified model for the estimation of solar cell efficiency based on the air mass effect," *The Academic Research Community Publication (ARChive-SR)* **3**(1) (2019) 199–204. (Presented at IEREK's International Conference on Alternative and Renewable Energy Quest (AREQ), Thessaloniki, Greece, 27–29 November 2017.)

12. M. Al-Addous, F. Alawneh, Z. Dalalah, C. B. Class, and **H. Al-Taani**, "Design and implementation of water desalination system (RO) using renewable energy source," *The Academic Research Community Publication (ARChive-SR)* **3**(1) (2019) 214–221. (Presented at AREQ 2017, Thessaloniki, Greece.)

13. Y. Al-Khatatbeh, K. Tarawneh, **H. Al-Taani**, and K. K. M. Lee, "Theoretical and experimental evidence for a post-cotunnite phase transition in hafnia at high pressures," *Journal of Superhard Materials* **40**(6) (2018) 374–383.

14. **H. Al-Taani** and S. Arabasi, "Solar irradiance measurements using smart devices: A cost-effective technique for estimation of solar irradiance for sustainable energy systems," *Sustainability* **10**(2) (2018) 508.

15. M. Al-Addous, Z. Dalala, C. B. Class, F. Alawneh, and **H. Al-Taani**, "Performance analysis of off-grid PV systems in the Jordan Valley," *Renewable Energy* **113** (2017) 930–941.

16. S. Arabasi and **H. Al-Taani**, "Measuring the Earth's magnetic field dip angle using a smartphone-aided setup: A simple experiment for introductory physics laboratories," *European Journal of Physics* **38**(2) (2017) 025201.

17. I. Jum'h, A. Abdelhay, **H. Al-Taani**, A. Telfah, M. Alnaief, and S. Rosiwal, "Fabrication and application of boron doped diamond BDD electrode in olive mill wastewater treatment in Jordan," *Journal of Water Reuse and Desalination* **7**(4) (2017) 502–510.

18. I. Jum'h, A. Telfah, J. Lambert, M. Gogiashvili, **H. Al-Taani**, and R. Hergenröder, "^{13}C and ^{1}H NMR measurements to investigate the kinetics and the mechanism of acetic acid (CH_3CO_2H) ionization as a model for organic acid dissociation dynamics for polymeric membrane water filtration," *Journal of Molecular Liquids* **227** (2017) 106–113.

19. I. Jum'h, M. S. Abd El-Sadek, **H. Al-Taani**, I. S. Yahia, and G. Karczewski, "Influence of illumination on the electrical properties of p-(ZnMgTe/ZnTe:N)/CdTe/n-(CdTe:I)/GaAs heterojunction grown by molecular beam epitaxy (MBE)," *Journal of Electronic Materials* **46**(2) (2017) 1061–1066.

20. I. Jum'h, M. Al-Addous, **H. Al-Taani**, M. S. Abd El-Sadek, and N. Ayoub, "Effect of boron concentration on nano-crystalline diamond deposited on niobium substrates," *Digest Journal of Nanomaterials and Biostructures* **12**(2) (2017) 589–593.

21. **H. Al-Taani**, I. Y. Jum'h, M. S. El-Sadek, and V. V. Dremov, "Super sharp-metal tips for combined scanning tunneling and force microscopy based on piezoelectric quartz tuning fork force sensors," *Digest Journal of Nanomaterials and Biostructures* **12**(1) (2017) 47–51.

22. I. Y. Jum'h, W. Al Sekhaneh, **H. Al-Taani**, and B. A. Albiss, "Preparation and characterization of high quality single-walled carbon nanotubes using arc discharge technique," *Digest Journal of Nanomaterials and Biostructures* **11**(2) (2016) 517–523.

23. **H. Al-Taani**, N. Saleh, and K. Al-Saleh, "Measurement of photon-induced L X-ray fluorescence cross sections for Ho and Yb in the 16.04–24.68 keV energy range," *Journal of Modern Physics* **5**(15) (2014) 1412.

24. A. Alsaad, A. Ahmad, **H. Al-Taani**, and R. Alshyab, "A first-principles-derived method for computing the piezoelectric coefficients of complex semiconductor $Sc_{1-x}Ga_xN$ alloys," *Physica B: Condensed Matter* **403**(23–24) (2008) 4174–4181.

Conference Papers and Book Chapters

25. **H. Al-Taani**, "A conceptual exercise to enhance student understanding in physics: A case study in introductory physics," *EDULEARN19 Proceedings*, Palma, Spain (2019) 9993–9996.

26. **H. Al-Taani**, "Using Algodoo© software in physics education: Static friction as an example," *INTED2019 Proceedings*, Valencia, Spain (2019) 6569–6574.

27. M. Al-Addous, **H. Al-Taani**, Z. Dalalah, F. Alawneh, and A. Albatayneh, "Wind resource assessment for a proposed wind farm," in *Advanced Studies in Energy Efficiency and Built Environment for Developing Countries*, Springer (2019) 179–189. (Presented at AREQ 2017, Thessaloniki, Greece.)

28. S. Arabasi, **H. Al-Taani**, and D. Ü. Kapanadze, "A visual and interactive learning tool: Frequency content of sound waves," *EDULEARN18 Proceedings (10th International Conference on Education and New Learning Technologies)* (2018).

29. **H. Al-Taani**, K. Tarawneh, Y. Al-Khatatbeh, and B. Hamad, "The high-pressure stability of Ni_2In-type structure of ZrO_2 with respect to OII and Fe_2P-type phases: A first-principles study," *IOP Conference Series: Materials Science and Engineering* **305** (2018) 012016. (2nd International Conference on Advanced Materials, ICAM-2017, Irbid, Jordan.)

30. M. DeAntonio, L. M. Sandoval, J. Dewald, **H. Al-Taani**, and J. Talla, "Work in progress – The use of team-based learning in an experimental physics lab," *37th Annual Frontiers in Education Conference (FIE'07)*, IEEE (2007) S1A-13.

Selected Large-Collaboration Publications (PHENIX at RHIC, BNL; ATHENA/EIC)

As a member of the PHENIX Collaboration during his doctoral research, H. Al-Taani is a co-author of the collaboration's publications from that period. Selected highly cited papers:

31. A. Adare et al. (PHENIX Collaboration), "Beam energy and centrality dependence of direct-photon emission from ultrarelativistic heavy-ion collisions," *Physical Review Letters* **123** (2019) 022301.

32. A. Adare et al. (PHENIX Collaboration), "Lévy-stable two-pion Bose–Einstein correlations in $\sqrt{s_{NN}} = 200$ GeV Au+Au collisions," *Physical Review C* **97** (2018) 064911.

33. A. Adare et al. (PHENIX Collaboration), "Transverse energy production and charged-particle multiplicity at midrapidity in various systems from $\sqrt{s_{NN}} = 7.7$ to 200 GeV," *Physical Review C* **93** (2016) 024901.

34. A. Adare et al. (PHENIX Collaboration), "Azimuthally anisotropic emission of low-momentum direct photons in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV," *Physical Review C* **94** (2016) 064901.

35. A. Adare et al. (PHENIX Collaboration), "Measurements of elliptic and triangular flow in high-multiplicity ^{3}He+Au collisions at $\sqrt{s_{NN}} = 200$ GeV," *Physical Review Letters* **115** (2015) 142301.

36. A. Adare et al. (PHENIX Collaboration), "Measurement of long-range angular correlation and quadrupole anisotropy of pions and (anti)protons in central d+Au collisions at $\sqrt{s_{NN}} = 200$ GeV," *Physical Review Letters* **114** (2015) 192301.

37. A. Adare et al. (PHENIX Collaboration), "Centrality dependence of low-momentum direct-photon production in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV," *Physical Review C* **91** (2015) 064904.

38. A. Adare et al. (PHENIX Collaboration), "Search for dark photons from neutral meson decays in p+p and d+Au collisions at $\sqrt{s_{NN}} = 200$ GeV," *Physical Review C* **91** (2015) 031901.

39. A. Adare et al. (PHENIX Collaboration), "Inclusive double-helicity asymmetries in neutral-pion and eta-meson production in $\vec{p}$+$\vec{p}$ collisions at $\sqrt{s} = 200$ GeV," *Physical Review D* **90** (2014) 012007.

40. A. Adare et al. (PHENIX Collaboration), "Cross section and parity-violating spin asymmetries of $W^{\pm}$ boson production in polarized p+p collisions at $\sqrt{s} = 500$ GeV," *Physical Review Letters* **106** (2011) 062001.

Workshops and Conferences

- The 3rd International Conference on the Role of Artificial Intelligence in Sustainable Development, Amman, Jordan, October 29–30, 2025.
- Flipped Learning Workshop for Educational Practitioners, Al Hussein Technical University, Amman, Jordan, 20 May 2025.
- Induction Training for Faculty Members, Al Hussein Technical University (HTU), Amman, Jordan, 9–12 October 2023.
- Motivation Through Visualization and Application with Maple, Hochschule Karlsruhe (HKA) and GJU, Amman, Jordan, 9–13 July 2023.
- Invited Participant – Innovation and Transfer Conference in collaboration with Technische Universität Berlin, funded by DAAD, Tunis, Tunisia, December 4–11, 2021.
- 11th International Conference on Education and New Learning Technologies (EDULEARN19), Palma, Spain, 1–3 July 2019.
- 13th International Technology, Education and Development Conference (INTED2019), Valencia, Spain, 11–13 March 2019.
- The 2nd International Conference on Advanced Materials (ICAM-2017), Irbid, Jordan, 10–13 July 2017.
- Winter Workshop 2015 on Heavy Metal Removal and Water Treatment, Amman, Jordan, 18 October 2015.

University and Community Service

- Member of the School Council, School of Computing, German Jordanian University, September 2025 – September 2026.
- Member of the Scientific Committee, The 3rd International Conference on the Role of Artificial Intelligence in Sustainable Development, Amman, Jordan, October 29–30, 2025.
- Member of the Hiring Committee, School of Social and Basic Sciences, Al Hussein Technical University, academic year 2024/2025.
- Member of the Curriculum Committee, School of Social and Basic Sciences, Al Hussein Technical University, academic year 2024/2025.
- Member of various committees (transfer, promotion, hiring, tenders, etc.), Basic Sciences Department, German Jordanian University.

- Member of the Students' Disciplinary Council, Deanship of Students Affairs, GJU, September 2021 – 2023.
- Member of the Scientific Research Council, Deanship of Scientific Research, GJU, September 2021 – September 2022.
- Enhancing relations with Leipzig University through a Staff Mobility Visit, Erasmus+ Program, Leipzig, Germany, September 2–9, 2022.
- Invited Participant – Innovation and Transfer Conference in collaboration with Technische Universität Berlin, funded by DAAD, Tunis, Tunisia, December 4–11, 2021.
- Member of the Organizing Committee, 1st International Conference on Current Nanotechnology and its Applications (ICCNA-2018), Irbid, Jordan, April 10–12, 2018.
- Reviewer for the conference proceedings of the 2nd International Conference on Advanced Materials (ICAM-2017), Irbid, Jordan, July 10–13, 2017.
- Contributed to consultation for the FAO through the GJU Biogas Lab, 10 February – 20 April 2017.
- Participated in IFAT 2015, the World's Leading Trade Fair for Water, Sewage, Waste and Raw Materials Management, through the GJU Biogas project, Munich, Germany.
- Organizing member of the international "Winter Workshop 2015 on Heavy Metal Removal and Water Treatment", a collaboration between GJU and the Leibniz Institute for Analytical Sciences (ISAS, Dortmund, Germany), 18 October 2015.

Achievements and Awards

2025	Promotion to the rank of Professor, German Jordanian University.
2023	License of Academic Practice, Ministry of Higher Education and Scientific Research, Jordan.
2022	Erasmus+ Staff Mobility visit to Leipzig University, Leipzig, Germany.
2019	Excellence in Teaching Award, German Jordanian University.
2015	GJU Train-the-Trainer Program, Hochschule Magdeburg-Stendal and the German Academic Exchange Service (DAAD).
2014	Excellence in Teaching Award, German Jordanian University.
2010	Outstanding Graduate Student Award, New Mexico State University.
2006	Graduate Student Scholarship, New Mexico State University.

Professional Memberships

- Jordan Society for Renewable Energy.
- The Jordanian Physics Society.