

# Faraj Ibrahim Bani Melhem

**MSc in Physics | Experimental Physics • Nanomaterials • Materials Characterization**

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## PROFESSIONAL PROFILE

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MSc Physics researcher with hands-on experience in experimental physics, nanomaterials, materials characterization, and laboratory research. Experienced in the synthesis and investigation of magnetic, semiconductor, silica-based, and other functional nanomaterials, with research involving alternating magnetic fields, magnetic hyperthermia, optical characterization, and biological applications. Skilled in scientific instrumentation, experimental design, quantitative data analysis, and laboratory research, with experience supporting and mentoring undergraduate and graduate students.

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## EDUCATION

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**Jordan University of Science and Technology, Irbid, Jordan**

**Aug 2021 - Jun 2026**

**Master of Science in Physics**

**GPA: 3.15/4**

**Thesis:** Effects of Alternating Magnetic Fields on A549 Lung Cancer Cells and Red Blood Cells in Combination with Fe<sub>3</sub>O<sub>4</sub> Nanoparticles

**Jordan University of Science and Technology, Irbid, Jordan**

**Aug 2017 - Aug 2021**

**Bachelor of Science in Physics**

**GPA: 3.06/4**

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## WORK EXPERIENCE

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**Jordan University of Science and Technology, Irbid, Jordan**

**Mar 2023 - Mar 2024**

**Teaching Assistant, Department of Physics**

- Supported undergraduate Physics laboratory sessions and guided students in experimental procedures and instrumentation.
- Assisted with experimental demonstrations, data analysis, laboratory safety, and practical assessment.

**Ministry of Education, Irbid, Jordan**

**Feb 2023 – Jan 2024**

**Physics Teacher**

**Apr 2025 – Jul 2025**

- Taught secondary-level Physics and conducted laboratory demonstrations and practical activities.
- Prepared experimental activities and instructional materials and supported students in practical learning.

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## RESEARCH EXPERIENCE

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**Physics Department, JUST University**

**May 2024 - Present**

**Research Assistant**

**Supervisor: Prof. M-Ali H. AL-Akhras (AL-Omari)**

- Conduct experimental research involving magnetic nanoparticles, alternating magnetic fields, and functional nanomaterials.
- Synthesize and characterize Fe<sub>3</sub>O<sub>4</sub>, cobalt ferrite, silica-based nanoparticles, and semiconductor quantum dots.
- Perform experimental measurements and materials characterization using UV-Vis, FTIR, XRD, SEM, TEM, photoluminescence, zeta potential, and particle-size analysis.
- Apply Python, Jupyter Notebook, OriginPro, and COMSOL Multiphysics for quantitative data analysis, curve fitting, modeling, and interpretation.
- Mentor undergraduate and graduate students in experimental design, laboratory procedures, instrumentation, data analysis, and scientific methodology.

## Research Projects:

1. Shinde A., Hamizi N.A., Wahab Y.A., Al-Akhras M.-A.H., Melhem F, A Comprehensive Review on Deposition Techniques and Electrolytes in Quantum Dot Sensitized Solar Cells: Insights into Green Chemistry Considerations, Inorganic Chemistry Communications, Vol. 184, 2025. DOI: [10.1016/j.inoche.2025.115971](https://doi.org/10.1016/j.inoche.2025.115971).
2. ***Ultrafast Microwave-Assisted Synthesis of CdSe Quantum Dots: Reaction-Time-Dependent Structural and Optical Evolution.*** (manuscript currently under revision)
3. ***Silica Nanoparticles Encapsulation of Hypericin: A Comparative Photodynamic Study Using Red Blood Cells as a Biological Model.*** (Submitted to Photochemistry & Photobiology 2026).
4. ***The influence of Photon Radiation in Semi-Rigid Artificial Tissue sensitized by safranin.*** (manuscript currently under revision)
5. ***Effects of Alternating Magnetic Fields on A549 Lung Cancer Cells and Red Blood Cells in Combination with Fe<sub>3</sub>O<sub>4</sub> Nanoparticles.*** (manuscript currently under revision)
6. ***Biocompatible Ginger-Derived Nanoparticles for Dual Anticancer and Antimicrobial Therapy via ROS-Driven Mechanisms.*** (Ongoing research project)

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## CONFERENCES & PRESENTATIONS

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- The 4<sup>th</sup> International Conference on Advanced Materials (Irbid, Jordan, May 2025)
- Humboldt Kolleg 2025: Sustainable Science Development – Transforming Industries & Society (Amman / Irbid, Jordan | Sep 2025)
- The 4<sup>th</sup> International Conference on Modern and Advanced Research (ICMAR 2025) (Turkey | Nov 2025)
- The 17<sup>th</sup> International Workshop on Advanced Materials (IWAM 2026) (United Arab Emirates | Feb 2026)

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## LEADERSHIP & MENTORING

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**Bio-Medical Physics Lab, JUST University**  
**Laboratory Mentorship and Training**

**May 2024 - Present**

- Mentor undergraduate and MSc students in experimental research, laboratory techniques, data analysis, and scientific methodology.
- Support students in scientific instrumentation, troubleshooting, experimental procedures, and laboratory safety.

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## SKILLS

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**Nanomaterials:** Fe<sub>3</sub>O<sub>4</sub> nanoparticles, cobalt ferrite, silica-based nanomaterials, CdSe quantum dots, functional nanomaterials

**Characterization:** UV–Vis, FTIR, XRD, SEM, TEM, EDX, photoluminescence, zeta potential, particle-size analysis, DLS, TGA

**Experimental:** Nanomaterial synthesis, sample preparation, experimental design, alternating magnetic fields, magnetic hyperthermia, laboratory instrumentation, troubleshooting

**Computational & Data Analysis:** Python, Jupyter Notebook, OriginPro, COMSOL Multiphysics, curve fitting, statistical analysis, data visualization