

Brenden Mears

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EDUCATION

University of Florida (UF); Gainesville, FL

- Doctor of Philosophy in Electrical and Computer Engineering (3.78 GPA) *Aug. 2022 – Dec. 2025*
- Master of Science in Electrical and Computer Engineering (3.76 GPA) *May 2023*
- Bachelor of Science in Electrical Engineering (3.76 GPA, Cum Laude) *May 2021*

RESEARCH INTERESTS

Millimeter Wave Systems, Antennas, Electromagnetism, Electromagnetic Materials, Magnetism

AWARDS AND HONORS

- 2nd Best Poster- IMAPS Florida Chapter Heterogeneous Integration Workshop *Aug. 2024*
- Best Poster in Advanced Packaging and Heterogeneous Integration- Florida Semiconductor Week *Feb. 2024*
- HWCOE Dean's Research Award *Apr. 2022*
- Robert A. Bryan Scholarship *Sep. 2020*

SECURITY CLEARANCE

Secret (Expired) through Universities Space Research Association *June 2021 – June 2023*

RELEVANT COURSEWORK

RF Systems	Introduction to RF Circuits (Fall 2022), Micro/Nano Machined Metamaterials (Spring 2022), Advanced Antenna Systems (Fall 2021)
Electromagnetism	Electromagnetic Theory II (Spring 2023), Fund of Photonics (Fall 2022), Applied Magnetics and Magnetic Materials (Spring 2020)
MEMS	Principles of MEMS (Spring 2023)
Leadership	Engineering Leadership (Fall 2023)

TECHNICAL SKILLS

MATLAB, Ansys HFSS, Vector Network Analyzer, COMSOL, Python, LTSpice, Solidworks, 3D Printing, C, C++

RESEARCH EXPERIENCE

Interdisciplinary Microsystems Group (IMG)- Research Assistant in Prof. David P. Arnold's Group

Aug. 2020 – Present

- **Flexible Polymer/Ferrite Composites for Millimeter Wave Applications** *Jun. 2024 – Present*
 - Analyzed three ferrites at three weight concentrations in a polymer matrix
 - Determined complex permittivity and permeability from 33 – 50 GHz
 - Magnetic composites have potential for use in millimeter wave devices and flexible electronics
- **Electromagnetic Interference Absorbing Composites for 5G and 6G Heterogeneous Integration** *Jan. 2024 – Present*
 - Explored opportunities to employ electromagnetic interference absorbing composites in heterogeneously integrated chips
 - Investigated viability of 3D printing/direct writing composites onto chips and printed circuit boards

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- **Magnetic Tweezers** *Aug. 2020 – Present*
 - Mentored an undergraduate student to become the lead designer and improve upon previous work
 - Designed, optimized, and developed a magnetic coil apparatus for magnetic field stimulation of live cells under a microscope
 - Used COMSOL to design and optimize the coil geometry, used Solidworks and a 3D printer to fabricate the coil apparatus
- **Barium Ferrite / Carbon Nanotube Composites for Millimeter-wave Electromagnetic Shielding Enhanced by Ferromagnetic Resonance Absorption** *Aug. 2022 – Mar. 2024*
 - Investigated composites of polymer and electromagnetic nanoparticles for electromagnetic interference shielding capabilities in the Q-band (33-50 GHz)
 - Designed experimental procedure to determine shielding effectiveness, complex permittivity, and complex permeability
 - Fabrication process is cost-effective, fast, and low temperature
- **Norovirus and Solar Quiet** *Aug. 2021 – Feb. 2022*
 - Analyzed norovirus cases as a function of the solar quiet: yearly variations in Earth's magnetic field
 - Used MATLAB to process 10+ years of magnetic field data and compared it to norovirus cases from 4 international locations
- **Construction Site Magnetic Inspection Car (COSMIC)** *Apr. 2021*
 - RC robot designed to inspect ultra-high-performance concrete (UHPC) for adequate concentration and homogenous distribution of steel fibers
 - Designed and implemented the sensing system, consisting of an LC tank circuit utilizing a search coil and an inductance to digital converter to communicate the metal concentration to the microcontroller
 - Effectively worked with a team of three other engineering students to integrate all systems, including sensing, controls, and local positioning
 - COSMIC was successful in that it was able to consistently detect slight differences in steel fiber concentrations and orientations in UHPC samples

JOURNAL PUBLICATIONS

- Mears, B.M., Freeman, F.M., Yoon, Y.-K. and Arnold, D.P. (2024), Barium Ferrite/Carbon Nanotube Nanocomposites for Millimeter-Wave Electromagnetic Shielding Enhanced by Ferromagnetic Resonance Absorption. Adv. Eng. Mater., 26: 2400084. <https://doi.org/10.1002/adem.202400084>

CONFERENCE PRESENTATIONS

- Mears, B.M. and Arnold, D.P. (Aug. 2024), Poster Presentation: Electromagnetic Interference Absorbing Composites for 5G and 6G Heterogeneous Integration. International Microelectronics Assembly and Packaging Society- Florida Chapter Heterogeneous Integration Workshop 2024
- Mears, B.M. and Arnold, D.P. (Feb. 2024), Poster Presentation: Electromagnetic Interference Absorbing Composites for 5G and 6G Heterogeneous Integration. Florida Semiconductor Week 2024
- Mears, B.M., Freeman, F.M., Yoon, Y.-K. and Arnold, D.P. (Oct. 2023), Oral Presentation: Barium Ferrite/Carbon Nanotube Nanocomposites for Millimeter-Wave Electromagnetic Shielding Enhanced by Ferromagnetic Resonance Absorption. Magnetism and Magnetic Materials 2023

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INTERNSHIP EXPERIENCE

National Institute of Standards and Technology (NIST)

- Visiting Researcher at NIST in Boulder, CO *May 2023 – Aug. 2023*
 - Worked with NIST researchers to learn a broadband, high-frequency materials characterization method developed at NIST
 - Method involves measuring a coplanar waveguide loaded with the material under test, utilizing a multi-line thru-reflect-line calibration, and performing de-embedding to isolate the material's response from the response of the system
 - Used advanced electromagnetic theory and linear algebra to develop code to process S parameter data into complex permittivity and permeability

Air Force Research Laboratory (AFRL)

- AFRL Scholar at Eglin AFB, FL *June 2022 – Aug. 2022*
 - Investigated loading dielectric resonator antenna with silicon to determine effects of optical stimulation on the radiation pattern
 - Modeled the antenna in COMSOL and designed an experiment to illuminate the antenna and measure the radiation pattern
- AFRL Scholar at Eglin AFB, FL (Virtual) *June 2021 – Aug. 2021*
 - Designed a miniaturized microstrip line (MSL) utilizing epsilon near zero (ENZ) dielectric while considering impedance matching, dielectric losses, and obtaining a tunable ENZ material
 - Used MATLAB and FDTD software to model and simulate the MSL impedance and the complex permittivity of the dielectric

LEADERSHIP AND SERVICE

Eta Kappa Nu (HKN), Epsilon Sigma Chapter

Sep. 2018 – Present

President

Apr. 2022 – Apr. 2024

- Led the chapter to earn the Outstanding Chapter Award (top ~10% of chapters) for 2022/23 and Key Chapter Award (top ~50% of chapters) for 2022/23 and 2023/24
- Significantly increased membership by more than doubling year on year recruiting in the 23/24 year
- Expanded the scope of the organization over two one-year terms by taking on additional projects, attending Student Leadership Conference, and increasing interaction with industry
- Assisted the leadership team in organizing a wide range of events including socials, community service, research seminars, corporate info sessions, and tutoring sessions

Recording Secretary

May 2020 – Apr. 2021

- Worked with the executive board of HKN to plan and execute events, such as volunteering events and tutoring sessions
- Determined eligibility for induction by checking candidate prerequisites and keeping record of candidates' points for induction

Outreach Chair

July 2019 – May 2020

- Organized events in the local Gainesville community aimed at teaching the basics of electrical engineering, such as circuits and digital logic, to local elementary and middle school students
- Collaborated with other engineering organizations at UF as well as local STEM groups to expand HKN's outreach efforts

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Institute of Electrical and Electronics Engineers (IEEE) UF Student Branch *Apr. 2022 – Present*
Secretary *Apr. 2022 – Apr. 2023*

- UF student branch was ranked as the best in the southeast US region comprising ~40 universities
- Helped IEEE achieve its strongest year in over five years in terms of attendance and quality, quantity, and variety of events
- Contributed to planning and execution of a variety of events, primarily social events

TEACHING EXPERIENCE

Supervised Teacher for Physics of Electrical Engineering *Jan. 2024 – May 2024*

- Assisted the professor with designing exams, quizzes, and course infrastructure
- Delivered a lecture on electromagnetic waves and held regular office hours

Teaching Assistant (TA) for Basic Electric Energy *Jan. 2021 – May 2022*

- Guided students through labs regarding the basics of three-phase electrical power and electrical machinery
- Demonstrated effective preparation and teaching ability as the sole lab TA for three semesters