Mark L. Adams

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Auburn University, Auburn, AL
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OVERVIEW

Results-driven professional with a progressive engineering career in academia with a strong background in the biotechnology and defense industries. Skilled at developing and executing targeted initiatives that drive customer growth, achieve program objectives, and enhance education and R&D. Highly effective communicator and team leader with proven ability to build long-term relationships with internal and external customers by establishing a high level of confidence and trust. Visionary leader with a keen understanding of business priorities and demonstrated expertise in rapidly advancing business goals to revenue-producing activities.

EDUCATION

PhD Electrical Engineering 2000-2004
California Institute of Technology
"Integration of optoelectronics and microfluidics for biological and chemical sensing."
Thesis advisor: A. Scherer (Caltech) / S. Quake (Stanford)

MS Electrical Engineering 1999-2000
California Institute of Technology

Bachelor of Electrical Engneering 1994-1997
Auburn University
Summa Cum Laude. Academic/Research advisor: H. Kirkici

APPOINTMENTS

Associate Professor of Electrical and Computer Engineering 2019-
Assistant Professor of Electrical and Computer Engineering 2014-2019
Auburn University

- Research: Wireless sensor networks, satellite communications, MEMS actuators and isolators, biomimetic and phased-array antennas, biophotonic sensors, quantum sensors and systems
- Teaching: Analog Electronics, Optoelectronics, RF Microelectronics, Applied Quantum Mechanics, Fundamentals of Molecular and Biophotonics, Microelectronic Fabrication
- Service: Member for numerous MS, Ph.D. committees and departmental search and selection committees.
- Assistant Director of the Alabama Micro/Nano Science and Technology Center

Founder and Managing Member 2007-
Systems Visions LLC - Veteran owned small business focused on research, development, engineering, consulting and training specializing in custom solutions for commercial and defense applications.
Core Competencies Include

- Computational Electromagnetics
- Antenna design
- Microsensor systems
- Point of care diagnostics
- Micro/nanofabrication
- Wireless sensor networks

Director of Engineering 2012-2013
ENSCO, Inc. National Security Solutions Division - A leading solutions provider for the national security, aerospace and rail communities.
Executive focused on strategic growth initiatives for the division including developing relationships with new customers in the knowledge discovery, chem/bio and ISR areas.

- Managed staff of hardware and software engineers focused on the design, development and delivery of sensor systems.
- Created an Advanced Development Programs Group to pursue far reaching/technically challenging problems.
- Worked closely with Corporate leadership and Strategic Programs to create and maintain a strategic technology roadmap for the division

Staff Engineer 2012
ATRM, LLC - A member of the Johnson & Johnson family of companies.
Principal member responsible for establishing miniaturized device and point-of-care diagnostic areas within the Nanotechnology and Processing group.

- Interfaced with multiple operating companies for various projects.
- Initiated new programs and projects.
- Established new program for MEMS based catheter.
- Developed optical model and test procedure for novel contact lens.
- Improved cell separation and mixing for a low-cost disposable lateral flow assay chip

Assistant Professor of Electrical and Computer Engineering 2009-2011
University of South Alabama

- Research: Optoelectronic devices, label-free detection and analysis, electromagnetic modelling
- Teaching: Circuits, Digital Signal Processing, Computer Architecture, Electromagnetic Theory, Ethics
- Service: Faculty senator for College of Engineering, chair of the departmental outreach committee

Business Development Manager / MEMS Development Engineer 2007-2009
Bioforce Nanosciences - The leading developer of ultra-miniaturized nanoarray technologies for biomolecular analysis.
Directed business development for acquisition of funding and product sales with an emphasis on government relations. Performed design, modeling, fabrication and testing of MEMS and microfluidic components. Performed design, modeling and testing of industrial electronics.

- Oversee all research and development activities related to new tool design.
- Provide operational support to facilitate the production of tools and instrumentation.
- Established new program for MEMS based catheter.
- Developed optical model and test procedure for novel contact lens.
- Improved cell separation and mixing for a low-cost disposable lateral flow assay chip

Director of Nano-bioengineering 2004-2007

ENSCO, Inc. - A leading solutions provider for the national security, aerospace and rail communities.
Principal member responsible for creating the Microsystems and Nanotechnology group within the company. Performed business development to provide sustainable income for research and development. Designed and developed a novel miniature buoyant probe for environmental and defense applications.

- Interfaced with NASA and Defense department program managers routinely.
- Initiated corporate wide lobbying effort for federal appropriations.
- Managed a team of five engineers and technicians.

REFEREED JOURNAL ARTICLES [statistics]

20. M. Bolt and M. L. Adams, "A high-speed dll-based hybrid phase conjugator for 5g beamforming," *Circuits and Systems*, 2020. (accepted for publication)

19. M. Bolt, J. C. Prather, T. Horton, and M. L. Adams, "Massively deployable, low-cost airborne sensor motes for atmospheric characterization," *Wireless Sensor Networks*, 2020. (accepted for publication)

18. M. Parit, H. Du, X. Zhang, C. Prather, M. Adams, and Z. Jiang, "Polypyrrole and cellulose nanofiber based composite films with improved physical and electrical properties for electromagnetic shielding applications," *Carbohydrate Polymers*, 2020. (accepted for publication)

17. Y. Meng, S. Mabry, P. Stewart, K. Cannon, L. Liu, M. Bolding, L. Zhang, and M. L. Adams, "Correlating the passive response of eye and brain to head impact using mems imus on 3d-printed human head phantom," *Physiological Measurement*, 2020. (accepted for publication)

16. B. Bottenfield, A. Bond, R. Dean, and M. L. Adams, "Variations in micromachined isolator geometries for sensor performance in harsh environments," *IEEE Transactions on Components, Packaging and Manufacturing Technology*, 2019

15. Y. Meng, R. Dean, and M. L. Adams, "Improving the phase delay capacitive interface circuit technique using mosfet switches," *Measurement Science and Technology*, 2019

14. Y. Wu, Y. Meng, B. Yakupoglu, and M. L. Adams, "A metamaterial / liquid-core waveguide microfluidic optical sensor," *Sensors & Actuators: A. Physical*, vol. 300, p. 201, 2019

13. J. C. Prather, M. Bolt, T. Horton, Y. Meng, and M. L. Adams, "Wireless head impact monitoring system utilizing eye movement as a surrogate for brain movement," *International Journal of Electronics and Communications*, vol. 105, pp. 54–61, 2019

12. J. C. Prather, M. Bolt, T. Horton, B. Bottenfield, S. Wentworth, and M. L. Adams, "Biomimetic antenna design for an airborne atmospheric probe," *IEEE Transactions on Antennas and Propagation*, vol. 67, no. 1, pp. 48 – 55, 2019

11. T. Horton, M. Bolt, J. C. Prather, J. Manobianco, and M. L. Adams, "Airborne network for atmospheric profiling," *Wireless Sensor Networks*, vol. 10, no. 4, pp. 93 – 101, 2018

10. M. Bolt, J. C. Prather, H. Harrell, T. Horton, J. Manobianco, and M. L. Adams, "Design and testing of novel airborne atmospheric sensor nodes," *IEEE Geoscience and Remote Sensing Letters*, vol. 15, pp. 73–77, Jan 2018

9. Y. Meng, B. Bottenfield, M. Bolding, L. Liu, and M. L. Adams, "Sensing passive eye response to impact induced head acceleration using mems imus," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 12, no. 1, pp. 182 – 191, 2017

8. J. C. Prather, M. Bolt, H. Harrell, J. Manobianco, and M. L. Adams, "Antenna design for a massive multiple input environmental sensor network," *Digital Communications and Networks*, vol. 2, no. 4, pp. 256 – 259, 2016

7. J. Manobianco, J. G. Dreher, R. J. Evans, and M. L. Adams, "The impact of simulated super pressure balloon data on regional weather analyses and forecasts," *Meteorology and Atmospheric Physics*, vol. 101, no. 1-2, pp. 21–41, 2008

6. J. Manobianco, J. G. Dreher, M. L. Adams, M. Buza, R. J. Evans, and J. L. Case, "How nanotechnology can revolutionize meteorological observing with lagrangian drifters," *Bulletin of the American Meteorological Society*, pp. 1105–1109, August 2008

5. M. L. Adams, J. Manobianco, and M. Buza, "Global environmental micro sensors test operations in the natural environment," *Sensors and Transducers*, pp. 30–41, October 2007

4. M. L. Adams, G. DeRose, M. Loncar, and A. Scherer, "Lithographically fabricated optical cavities for refractive index sensing," *Journal of Vacuum Science Technology B*, vol. 23, no. 6, pp. 3168–3173, 2005

3. M. L. Adams, M. Loncar, A. Scherer, and Y. ming Qiu, "Microfluidic integration of porous photonic crystal nanolasers for chemical sensing," *IEEE Journal on Selected Areas in Communications*, vol. 23, no. 7, pp. 1348–1354, 2005

2. M. L. Adams, M. L. Johnston, S. Quake, and A. Scherer, "Polydimethylsiloxane based microfluidic diode," *Journal of Micromechanics and Microengineering*, vol. 15, no. 8, pp. 1–5, 2005

1. M. L. Adams, M. Enzelberger, S. Quake, and A. Scherer, "Microfluidic integration of detector arrays for absorption and fluorescence micro-spectrometers," *Sensors and Actuators A*, vol. 104, no. 1, pp. 25–31, 2003

PENDING MANUSCRIPTS

- B. Bottenfield, A. Bond, B. English, R. Dean, and M. L. Adams, "A microfibrous mesh damped microisolator for shock and vibration reliability," *IEEE Journal of Microelectromechanical Systems*, 2020

REFEREED CONFERENCE PROCEEDINGS

20. Y. Meng and M. L. Adams, "Correlating the passive response of eye and brain to head impact," in *40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, July 2018

19. J. C. Prather, M. Bolt, T. Horton, J. Manobianco, and M. L. Adams, "Atmospheric probe for real time weather monitoring," in *IMAPS 50th International Symposium on Microelectronics: Fall 2017*, pp. 280–285, November 2017

18. Y. Meng, L. Liu, M. Bolding, and M. L. Adams, "Application of mems accelerometers in sensing passive eye response as a surrogate for brain response to head acceleration," in *IEEE Sensors 2016*, pp. 1–3, 2016

17. M. L. Adams, "Optimized surface patterning tools for sub-attoliter volume fluid deposition," in *Proceedings of NSTI Nanotech 2010*, vol. 2, pp. 480–483, 2010

16. R. J. Evans, J. G. Dreher, J. Manobianco, and M. L. Adams, "Mapit: An airborne system for urban environmental monitoring," in *American Meterological Society Annual Meeting 2006*, vol. J, pp. 4–8, 2006

15. M. L. Adams and J. Manobianco, "Orb: An airborne microsensor observing platform," in *Proceedings of Smart Structures and Materials*, vol. 5758, pp. 265–273, 2005

14. J. G. Dreher, J. Manobianco, and M. L. Adams, "Global environmental micro sensors (gems) – a new in situ observing system for research and operational meteorology," in *First THORPEX International Science Symposium, Montreal, Quebec*, pp. 117–121, 2005

13. J. Bickford, S. George, M. L. Adams, J. Manobianco, and D. Manobianco, "Large scale deployment and operation of distributed sensor assets optimized for robust mars exploration," in *Proceedings Of NASA/DOD Conference on Evolvable Hardware*, pp. 173–182, 2005

12. M. L. Adams, J. Manobianco, J. Bickford, and D. Manobianco, "In situ atmospheric profiling using mobile ad hoc sensor networks," in *Proceedings of NSTI Nanotech 2005*, pp. 173–182, 2005

11. M. L. Adams, J. Manobianco, and J. Bickford, "Mobile ad hoc networks for in situ atmospheric sensing," in *Proceedings of IEEE Wireless and Microwave Conference*, vol. FD-3, pp. 1–4, 2005

10. M. L. Adams and J. Manobianco, "Gems: A mobile wireless network for atmospheric sampling," in *Proceedings of SPIE Defense and Security Symposium*, vol. 5819, pp. 183–191, 2005

9. A. Scherer, M. Loncar, B. Maune, M. L. Adams, and T. Yoshie, "Photonic crystal microcavity lasers," in *International Quantum Electronics Conference 2004*, p. 1073, 2004

8. A. Scherer, M. Loncar, B. Maune, M. L. Adams, and T. Yoshie, "Photonic crystal microcavity lasers," in *Conference on Lasers and Electro-Optics 2004*, p. 1, 2004

7. M. Loncar, M. L. Adams, B. Maune, M. Hochberg, S. Quake, A. Scherer, and Y. ming Qiu, "Chemical sensors based on photonic crystal nanolasers," in *OSA Conference on Laser Applications to Chemical and Environmental Analysis*, vol. MB5, p. 1, 2004

6. G. DeRose, M. Loncar, M. L. Adams, M. Hochberg, and A. Scherer, "Lithographic nanofabrication of optical cavities," in *Proceedings of SPIE Optics East 2004*, vol. 5592, pp. 44–50, 2004

5. A. Scherer, M. Loncar, K. Okamoto, T. Yoshie, M. L. Adams, and J. Witzens, "Light concentration in photonic crystal and plasmon optical cavities," in *Proceedings Of IEEE Lasers and Electro-Optics Society 2004*, pp. 815–816, 2004

4. M. L. Adams, S. Quake, and A. Scherer, "Vertical cavity enhanced spectroscopy for microfluidic structures," in *Micro Total Analysis Systems 2003*, vol. 1, pp. 829–832, 2003

3. M. L. Adams, G. DeRose, S. Quake, and A. Scherer, "Fundamental approach for optoelectronic and microfluidic integration for miniaturizing spectroscopic devices," in *Proceedings of Functional Integration of Opto-Electro-Mechanical Devices and Systems II*, vol. 4647, pp. 1–6, 2002

2. M. L. Adams, S. Quake, and A. Scherer, "On-chip absorption and fluorescence spectroscopy with polydimethylsiloxane (pdms) channels," in *IEEE-EMBS Special Topics Conference on Microtechnologies in Medicine and Biology*, pp. 369–373, 2002

1. M. L. Adams, S. Quake, and A. Scherer, "Integrated on-chip absorption and luminescence spectroscopy with polydimethylsiloxane (pdms) channels using broadband illumination," in *Micro Total Analysis Systems 2002*, vol. 1, pp. 275–277, 2002

CONFERENCE ABSTRACTS AND PRESENTATIONS

10. M. L. Adams, "A novel metamaterial based microfluidic optical sensor," in *IEEE RAPID 2019*, August 2019

9. B. Bottenfield, Y. Meng, and M. L. Adams, "Instrumentation for sensing passive eye response due to head impact via mems imus," in *IMAPS Device Packaging Conference 2018*, March 2018

8. J. C. Prather, M. Bolt, H. Harrell, T. Horton, J. Manobianco, and M. L. Adams, "Evaluation of an in situ atmospheric system for real time weather monitoring," in *IMAPS Device Packaging Conference 2017*, March 2017

7. Y. Wu and M. L. Adams, "Modeling of a diffraction grating coupled waveguide based biosensor for microfluidic applications," in *COMSOL Conference 2016*, October 2016

6. M. L. Adams, A. R. Shapland, M. Gutierrez, T. Watkins, J. Blume, H. Harrell, and J. C. Prather, "Enhancements of an in situ atmospheric system for real time weather monitoring," in *IMAPS Device Packaging Conference 2016*, March 2016

5. J. Manobianco, M. L. Adams, and J. Zack, "Globalsense: A new atmospheric observing system featuring innovative airborne probes," in *20th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface*, January 2016

4. M. L. Adams, A. R. Shapland, M. Gutierrez, and E. Owen, "An in situ atmospheric probe for real time weather monitoring," in *IMAPS Device Packaging Conference 2015*, March 2015

3. R. Dean, F. Werner, and M. L. Adams, "A pcb technology electrical conductivity sensor for the measurement of saltwater contamination," in *IMAPS Device Packaging Conference 2015*, March 2015

2. J. G. Dreher, J. Manobianco, and M. L. Adams, "The impact of simulated gems observations on regional weather forecasts," in *17th Conference on Numerical Weather Prediction*, 2005

1. H. Kirkici and M. L. Adams, "Surface breakdown and surface flashover characteristics of diamond and dlc thin films on dielectric substrates in vacuum," in *IEEE Conference on Electrical Insulation and Dielectric Phenomena*, 1996

MAGAZINES

1. B. Bottenfield, Y. Meng, and M. L. Adams, "Instrumentation for sensing passive eye response due to head impact via mems imus," *Advancing Microelectronics*, vol. 46, no. 2, pp. 16–19, 2019

SEMINARS AND COLLOQUIA

7. IEEE Mobile Section, A Novel Metamaterial Based Microfluidic Optical Biosensor, 2020

6. IEEE Mobile Section, Sensing Passive Eye Response to Characterize Traumatic Brain Injury, 2018

5. Auburn University Biomedical Engineering Society, Application of MEMS Inertial Sensors in Sensing Passive Eye Response as a Surrogate for Brain Response to Head Acceleration and Rotation, 2017

4. Auburn Faculty Research Symposium, Explorations in Quantum Imaging, 2017

3. Auburn University Small Satellite Symposium, High Speed Communication With SmallSats, 2017

2. Harris Corporation, Auburn University Electrical and Computer Engineering Micro/Nanosystems R&D – an Overview, 2015

1. IEEE Mobile Section, Engineering the Life Sciences: How engineers are contributing to advances in biology and medicine, 2010

FUNDING [≈$5M/5yr]

- U.S. Army Combat Capabilities Development Command Aviation and Missile Center (CCDC AVMC), "Design and Fabrication of an Entangled Microwave Photon Source", $82,433 (Co-PI, 9/19-9/20).
- U.S. Army Space and Missile Defense Command (USASMDC) / T2S Solutions, "Polaris", $3,000,000 (PI, 5/19-12/20).
- U.S. Army CCDC AVMC / Dynetics, "Radar Vulnerability Study", $121,000 (PI, 1/19 - 12/19).

- University NanoSat Program, "Trusted-node Quantum Key Distribution from a CubeSat", $165,000 (Co-PI, 1/19 - 12/20).
- National Science Foundation (NSF), "FiWIN I/UCRC Membership", $299,998 (Co-PI, 09/18 - 08/20).
- Dynetics, "FiWIN I/UCRC Corporate Membership", $50,000 (PI, 09/18 - 08/20).
- Missile Defense Agency (MDA) / Engenius Micro, "High-G MEMS IMU Phase II", $224,998 (PI, 10/17 - 08/19).
- U.S. Army / Kord Technologies, "Multi-Mission High Energy Laser Prototype Effort in Support of the All-Digital Radar Task", $40,334 (co-PI, 11/17 - 12/18).
- USASMDC / BAE, "D3I: TORP 1-1802 Satellite Ground Station Study", $21,005 (PI, 05/18 - 9/18).
- Harris Corporation, "Compact Micro Assembly System", $337,662 (PI, 1/15 - 5/20).
- USASMDC / BAE, "Cyber Security of Space Assets TO 1609", $280,573 (PI, 9/16 - 9/18).
- National Oceanic and Atmospheric Administration (NOAA) / Mano Nanotechnologies Inc. (MNI), "GlobalSense System Development and Demonstration", $180,101 (PI, 6/16 - 4/19).
- National Aeronautics and Space Administration (NASA), "ASGC Workforce Development Projects with Student Participation Stats", $26,500 (Co-PI, 4/15 - 3/19).
- National Institutes of Health (NIH), "Passive Eye Response As A Surrogate For Brain Response To Head Acceleration", $125,322 (PI, 8/07 - 7/10).
- USASMDC / BAE, "Cyber Security of Space Assets TO 1410", $100,000 (PI, 9/15 - 9/16).
- NOAA / MNI, "GlobalSense: A New Atmospheric Observing System Featuring Innovative Airborne Probes", $31,058 (PI, 7/15 - 1/16).

PATENTS [9 awarded / 3 provisional]

- **Microfabricated Elastomeric Valve and Pump Systems:** M. Unger, H. Chou, T. Thorsen, A. Scherer, S. Quake, M. Enzelberger, M. Adams and C. Hansen
  Pat. Nos. 6,899,137, 6,936,030, 7,216,671, 7,754,010 and 7,766,055
- **Dry Etching and Mirror Deposition Processes For Silicone Elastomers:** M. Adams and A. Scherer
  Pat. No. 6,936,141
- **Method of Forming a Via in a Microfabricated Elastomer Structure:** M. Unger, H. Chou, T. Thorsen, A. Scherer, S. Quake, M. Adams and C. Hansen
  Pat. No. 7,250,128
- **Method and apparatus for CMOS imagers and spectroscopy:** M. Adams and A. Scherer
  Pat. No. 7,466,409
- **Optoelectronic and Microfluidic Integration for Miniaturized Spectroscopic Devices:** M. Adams, S. Quake and A. Scherer
  Pat. No. 7,524,459

STUDENTS SUPERVISED

1. Yuan Meng – PhD 12/18 "Application of MEMS Inertial Sensors in Sensing Passive Eye Response as a Surrogate for Brain Response to Head Acceleration and Rotation for On-field Objective Assessment of Concussion" *Auburn University*
2. Johnathon Craig Prather – MS 12/16 "Dual Antenna Design for a Novel Airborne Probe"

   Johnathon Craig Prather – PhD 6/19 "Biomimetic Antenna Design for an Atmospheric Probe" *The Aerospace Corporation*

   Other (non-thesis) MS completion: Haley Harrell '17 (*Ball Aerospace*), Andrew Cookston '18 (*TSC*), Brent Bottenfield (*Auburn*) and Tyler Horton '18 (*Ball Aerospace*)

SYNERGISTIC ACTIVITIES

- Majority partner and chief engineer of Systems Visions LLC, a veteran owned small business that focuses on innovative technological solutions to challenging problems. Experience with payload development and integration for small unmanned systems.
- Proposal reviewer: NSF, Internal Auburn University
- Referee: Digital Communications and Networks, IEEE Sensors, ISA Transactions
- Organizing Committee: IEEE Research and Applications of Photonics in Defense (2018)
- Session Chair: InterPACK Conference (2017), IMAPS Device Packaging Conference (2015,2016)
- Senior Member: IEEE, AIAA
- Member: ASM, SPIE, IMAPS, ASME

AWARDS

- 2017 Auburn Alumni Engineering Council Faculty Research Award (Junior)
- 2016 Graduate Advisor of Michael Bolt – Woltosz Graduate Fellowship Winner
- 2015 New Faculty Scholars Graduate
- 2011 Teacher of the year, Department of Electrical and Computer Engineering, University of South Alabama
- 1997 NSF Graduate Fellowship

UNIVERSITY SERVICE

- ECE faculty search committee 2015, 2016, 2018
- SGCOE selection committee for distinguished dissertation awards
- SGCOE selection committee for 100 Women Strong and Alley Family fellowships
- Board of directors for AU chapter of National Academy of Inventors
- Faculty senate competitive research grant committee

TEACHING

@ Auburn University, ECE Dept.:

- Fall 18: **ELEC 5970/6970 Optoelectronics**
- Summer 18: **ELEC 7780 RF Microelectronics**
- Fall 17: **ELEC 7970 Applied Quantum Mechanics**
- Spring 17: **ELEC 5730/6730 Microelectronics Fabrication**
- Fall 16: **ELEC 5730/6730 Microelectronics Fabrication**
- Fall 15: **ELEC 3700 Analog Electronics**
- Spring 15: **ELEC 7970 Fundamentals of Molecular and Biophotonics**
- Fall 14: **ELEC 5730/6730 Microelectronics Fabrication**

@ University of South Alabama, ECE Dept.:

- Fall 11: **EE365 Digital Signal Processing**
- Fall 11: **EG220 Electrical Circuits**
- Fall 11: **EE356 Electromagnetics Laboratory**
- Spring 11: **EE355 Electromagnetics II**
- Spring 11: **EG220 Electrical Circuits**
- Spring 11: **EE356 Electromagnetics Laboratory**
- Fall 10: **EE560 Advanced Computer Architecture**
- Fall 10: **EE365 Digital Signal Processing**
- Fall 10: **EE356 Electromagnetics Laboratory**
- Summer 10: **EG501 Professionalism, Research Integrity and Seminar**
- Spring 10: **EE465/565 Advanced Digital Signal Processing**

- Spring 10: **EE365 Digital Signal Processing**
- Spring 10: **EE356 Electromagnetics Laboratory**
- Fall 09: **EE560 Advanced Computer Architecture**
- Fall 09: **EE365 Digital Signal Processing**
- Fall 09: **EE356 Electromagnetics Laboratory**