

Robert N. Dean, Jr.

Assistant Professor
Electrical and Computer Engineering Department
Auburn University
200 Broun Hall
Auburn, AL 36849
Phone: (334) 844-1838
Fax: (334) 844-1809
Email: deanron@auburn.edu

EDUCATION:

- **Ph.D. ECE:** Auburn University: Auburn, AL, 2006
Areas of concentration: Electronics and Controls
Dissertation topic: A Technique for the Measurement of Relative Velocity Between Parallel Plate Electrodes in Micromachined Structures
- **MS in EE:** Auburn University, 1991
- **BEE:** Auburn University, 1988
- **Additional Education:**
Heat Transfer in Electronic Packaging Short Course, 2004
Chip Scale Packaging Technology Short Course, 2001
Flip Chip Technology Short Course, 2000
Xilinx Programmable Logic Training Course, 1995

SUMMARY OF QUALIFICATIONS:

- 17+ years of professional experience
- U.S. citizen
- Active SECRET clearance
- Expertise in MEMS, device packaging, and analog/digital/mixed signal design
- Project and program management

PROFESSIONAL EXPERIENCE:

- 2007 – pres. **Assistant Professor, Dept. of Electrical and Computer Engineering, Auburn University.**
Teaches graduate and undergraduate courses in electronics, MEMS and sensors. Conducts research in MEMS and advanced packaging. Recent projects include: advanced MEMS gyroscope development, passive and active vibration isolation systems for sensitive MEMS devices, and ultra-thin electronics.
- 2006 – 2007 **Assistant Research Professor, Dept. of Electrical and Computer Engineering, Auburn University.**
Conducted microsystems research and manages microsystems research. Developed and tested MEMS devices, packaging and systems, including support electronics and software. Develops manufacturing processes for MEMS devices and packaging. Designed custom instrumentation (analog, digital, mixed-signal, microcontroller, PC interfacing and software). Projects included: advanced controllers for MEMS actuators; the characterization and mitigation of the deleterious effects of high power acoustic noise on MEMS gyroscopes; and the development of novel interface electronics for electrostatic MEMS devices.

- 1999 – 2006 **Research Associate IV, Center for Advanced Vehicle Electronics at Auburn University**
Conducted microsystems research and manages microsystems research activities and personnel at the Center. Developed and tested MEMS devices, packaging and systems, including support electronics and software. Developed manufacturing processes for MEMS devices and packaging. Designed custom instrumentation. Projects included: a novel technique for measuring the relative velocity between micromachined structures; MEMS actuators; MEMS mechanical low-pass filters for vibration isolation; microfluidic devices for thermal management; hermetic packaging for nano-devices; silicon MEMS devices; advanced packaging for COTS MEMS devices; and micromachining process development for non-silicon materials, including for biomedical applications.
- 1997 - 1999 **RF CMOS Designer, SY Technology, Inc., Huntsville, AL**
Designed electronics and MEMS devices for various DOD and commercial projects. Also managed several DOD projects. Projects included: 3D helical micromachined antenna structures for submillimeter sensing, process development for a 325 element MEMS mirror for adaptive optics, low-stress packaging for large MEMS devices, multiple-output power supply design for various MEMS actuators, design of electronics for interfacing to MEMS devices, hardware and software interfacing of custom electronics to PC's, design of a CMOS imaging array test chip, design of a precision programmable dual current source, design of two PCI based DSP boards for video applications, and design of a multi-processor Hartmann wavefront sensor DSP board.
- 1992-1997 **Electronics Designer, Dynetics, Inc., Huntsville, AL**
Designed electronics for various DOD and commercial projects. Projects included: a video identification and processing system, a VME baseband radar signal pre-processor for a 2-D optical correlator, high-speed A/D and D/A boards, PLL frequency synthesizer design, DSP boards, a hand-held orientation input device for industrial robots, audio scramblers and descramblers, custom test equipment, and interfacing hardware to PC's.
- 1991-1992 **Systems Analyst, Dynetics, Inc., Fort Walton Beach, FL**
Performed hardware-in-the-loop testing and analysis of the radar receiver for the AMRAAM missile program at Eglin AFB. Testing included pre-flight, post-flight and ECM/ECCM.
- 1989-1991 **Research Assistant, Center for the Commercial Development of Space at Auburn University**
Performed research in micromachined sensors and associated electronics for the US Space Station project. Designed, simulated, prototyped, and tested a full-custom CMOS integrated circuit for interfacing with capacitive transducers.

PROFESSIONAL PUBLICATIONS & PRESENTATIONS:

- R. Dean, J. Weller, M. Bozack, C. Rodekohr, B. Farrell, L. Jauniskis, J. Ting, D. Edell and J. Hetke, "Realization of Ultra Fine Pitch Traces on LCP Substrates," IEEE Trans. on Components and Packaging Technologies, Vol. 31, No. 2, June 2008, pp. 315-321.
- B. Holland, R. McPherson, T. Zhang, Z. Hou, R. Dean, R.W. Johnson, L.D. Castillo and A. Moussessian, "Ultra-thin, flexible electronics," 2008 Electronic Components and Technology Conference (ECTC 2008), Lake Buena Vista, FL, May 27-28, 2008.
- B. Holland, R. McPherson, R. Dean, R.W. Johnson and L. Del Castillo, "Handling and processing of die for use in ultra-thin flexible electronics," IMAPS ATW and Tabletop Exhibition on Military, Aerospace, Space and Homeland Security, Linthicum Heights, MD, April 30 – May 1, 2008.
- R. Dean, G.T. Flower and S. Castro, "Developments in foreign MEMS gyroscopic sensors," Tennessee Valley Emerging Technology Conference, Huntsville, AL, March 26-28, 2008.

- S.J. Kim, C. Chen, R. Dean, G. Flowers, A.S. Hodel, S.J. Reeves, "A packaging solution to Reduce Electrical Noise in MEMS Capacitive Elements Resulting from Environmental mechanical vibrations," 2008 IMAPS Device Packaging Conference, Scottsdale, AZ, March 17-20, 2008.
- S.J. Kim, C. Chen, G. Flowers and R. Dean, "Active damping control of micromachined devices in a low atmospheric pressure environment," Proc. of SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring 2008, Vol. 6928, San Diego, CA, March 9-13, 2008 (11pp).
- J.E. Rogers, R. Ramadoss, P.M. Ozmun, and R. N. Dean, "A microelectromechanical accelerometer fabricated using printed circuit processing techniques" Journal of Micromechanics and Microengineering, Vol. 18, 2008 (7pp).
- R. Ramadoss, R. Dean and X. Xiong, "MEMS Testing", Chapter 13 in L. T. Wang, C. Stroud, and N. Touba (Eds.), System on Chip Test Architectures: Nanometer Design for Testability, Elsevier, Burlington, MA, First Edition, 2008, pp. 591-652.
- S. Castro, G. Roth, R. Dean, G. Flowers and B. Grantham, "Influence of acoustic noise on the dynamic performance of MEMS gyroscopes," Proc of IMECE2007: the 2007 ASME Int. Mech. Eng. Congress and Exposition, Seattle, WA, Nov. 11-15, 2007, (7pp).
- R. Dean, J. Pack, N. Sanders, P. Reiner, C.W. Long and R. Fenner, "Porous ceramic packaging for MEMS chemical sensors requiring environmental access," IEEE Trans. on Advanced Packaging, manuscript submitted 10/31/07.
- R. Dean, G. Flowers, A. Ahmed, A. Hodel, G. Roth, S. Castro, R. Zhou, R. Rifki, A. Moreira, B. Grantham, D. Bittle and J. Brunsch, "On the Degradation of MEMS Gyroscope Performance in the Presence of High Power Acoustic Noise," Proc. of the 2007 IEEE Int. Symposium on Industrial Electronics (ISIE 2007), Vigo, Spain, June 4-7, 2007, pp. 1435-1440.
- J. E. Rogers, R. Ramadoss, P. M. Ozmun, and R. N. Dean, "MEMS Accelerometer Fabricated Using Printed Circuit Processing Techniques," Proc. of the 2007 IEEE Int. Symposium on Industrial Electronics (ISIE), Vigo, Spain, June 4-7, 2007, pp. 3250 - 3254.
- R. Dean, G. Flowers, R. Horvath, N. Sanders, S. Hodel, J. Hung and T. Roppel, "Characterization and Experimental Verification of the Nonlinear Distortion in a Technique for Measuring Relative Velocity between Micromachined Structures in Normal Translational Motion," IEEE Sensors Journal, Vol. 7, No. 4, April 2007, pp. 496-501.
- R. Dean, G. Flowers, A. Ahmed, A. Hodel, G. Roth, S. Castro, R. Zhou, R. Rifki, A. Moreira, J. Brunsch, D. Bittle and B. Grantham, "An Investigation of the Deleterious Effects of High Power, High Frequency Acoustic Noise on MEMS Gyroscopes," 2007 International Conference and Exhibition on Device Packaging, Optoelectronics – Photonics Advances in Optoelectronic Packaging, Scottsdale, AZ, March 18-22, 2007.
- D. K. Harris, A. Palkar and R. Dean, "High Heat Value Micro-Heat-Pipe Arrays Using a Liquid Metal as the Working Fluid," 2007 International Conference and Exhibition on Device Packaging, MEMS – MEMS and Related Microsystems, AZ, March 18-22, 2007.
- R. Dean, J. Weller, M. Bozack, B. Farrell, L. Jauniskis, J. Ting, D. Edell, and J. Hetke, "Micromachined LCP Connectors for Packaging MEMS Devices in Biological Environments," J. Microelectronics and Electronic Packaging, Vol. 4, No. 1, 1st Qtr. 2007, pp. 17-22.
- J. E. Rogers, P. M. Ozmun, J. H. Hung and R. N. Dean, "Bi-Directional Gap Closing MEMS Actuator Using Timing and Control Techniques," Proc. of the 32nd Annual Conference of the IEEE Industrial Electronics Society (IECON 06), Paris, France, Nov. 18, 2006, pp. 3149 -3154.

- R. Dean, G. Flowers and D. Harris, "Microsystems Technologies to Augment Liquid Bio-Fuels Production," Alternative Energy Solutions from Alabama's Natural Resources Conference, Auburn, AL, October 23-24, 2006, Poster Presentation.
- A. Anderson, R. Dean, G. Flowers and A. S. Hodel; "Low Cost Test Apparatus for MEMS Inertial Sensors;" Proceedings of The 3rd International Conference on Cybernetics and Information Technologies, Systems and Applications; jointly with The 4th International Conference on Computing, Communications and Control Technologies; Vol. II; Orlando; Florida; July 20-23; 2006; pages 175-179.
- R. Dean, N. Sanders, J. Pack and P. Reiner, "Porous Ceramic Packaging for MEMS Sensors Requiring Environmental Access," IMAPS International Conference and Exhibition on Device Packaging, MEMS – Assembly and Packaging Technical Workshop, Scottsdale, AZ, March 20-23, 2006.
- D. Harris, R. Dean, O. Nadgouda, N. Sanders, C. Ellis and M. Palmer, "A Package Sealing Technique for Mercury Filled Microfluidic Devices," IMAPS International Conference and Exhibition on Device Packaging, MEMS – Wafer Bonding Technical Workshop, Scottsdale, AZ, March 20-23, 2006.
- R. Dean, G. Flowers, N. Sanders, R. Horvath, W. Johnson, M. Kranz, and M. Whitley, "Experimental Validation and Testing of Components for Active Damping Control for Micromachined Mechanical Vibration Isolation Filters using Electrostatic Actuation," Proc. of SPIE Smart Structures / NDE Conference, Vol. 6172, San Diego, CA, Feb. 26 - March 2, 2006, pp. 362-372.
- R. Dean, G. Flowers, N. Sanders, R. Horvath, M. Kranz and M. Whitley, "Micromachined Vibration Isolation Filters to Enhance Packaging for Mechanically Harsh Environments," J. Microelectronics and Electronic Packaging, Vol. 2, No. 4, 4th Qtr. 2005, pp. 223-231.
- R. N. Dean, J. Y. Hung, and B. M. Wilamowski, "Advanced Controllers for Microelectromechanical Actuators," 2005 IEEE International Conference on Industrial Technology, Hong Kong, December 14-17, 2005, pp. 899-904.
- R. Dean, J. Pack, N. Sanders, P. Reiner, "Micromachined LCP for Packaging MEMS Sensors," Proc. of IEEE IECON 2005 Conference, Raleigh, NC, Nov. 6-10, 2005, pp. 2363-2367.
- R. Dean, G. Flowers, N. Sanders, K. MacAllister, R. Horvath, A. S. Hodel, W. Johnson, M. Kranz and M. Whitley, "Active Micromachined Vibration Isolation Filters using Electrostatic Actuation to Enhance Packaging for Mechanically Harsh Environments," IMAPS International Conference and Exhibition on Device Packaging, Proc. CD-only, Scottsdale, AZ, March 13-16, 2005.
- R. Dean, G. Flowers, N. Sanders, K. MacAllister, R. Horvath, A. S. Hodel, W. Johnson, M. Kranz and M. Whitley, "Damping Control of Micromachined Lowpass Mechanical Vibration Isolation Filters using Electrostatic Actuation with Electronic Signal Processing," Proceedings of the SPIE International Symposia on Smart Structures & Materials, SPIE Vol. 5760, San Diego, CA, March 6-10, 2005, pp. 11-22.
- R. Dean, G. Flowers, K. MacAllister, N. Sanders, and M. Kranz, "Micromachined Packaging Structures for Isolating Sensitive Devices from High Frequency Mechanical Vibrations," IMAPS Workshop on Packaging of MEMS and Related Micro-Nano-Bio Integrated Systems, Long Beach, CA, Nov. 18-19, 2004.
- R. Dean, J. Weller, M. Bozack, K. MacAllister, N. Sanders, B. Farrell, L. Jauniskis, J. Ting, D. Edell and J. Hetke, "Surface Micromachining of Thin Films on LCP Substrates for Biomedical Applications," IMAPS Workshop on Packaging of MEMS and Related Micro-Nano-Bio Integrated Systems, Long Beach, CA, Nov. 18-19, 2004.

- R. Dean, J. Weller, M. Bozack, B. Farrell, L. Jauniskis, J. Ting, D. Edell, and J. Hetke, "Novel Biomedical Implant Interconnects Utilizing Micromachined LCP," Proceedings of the International Symposia on Optical Science and Technology, SPIE Vol. 5515, Denver, CO, Aug. 2-6, 2004, pp. 88-99.
- B. Farrell, P. Jaynes, W. Johnson and R. Dean, "The Liquid Crystal Polymer Packaging Solution," IMAPS 2003, The 36th International Symposium on Microelectronics, Boston, MA, Nov. 16-20, 2003.
- B. Farrell P. Jaynes, W. Johnson and R. Dean," The Liquid Crystal Polymer Packaging Solution," MICRO SYSTEM Technologies 2003, Munich, Germany, Oct. 6-8, 2003.
- R. Dean, T. Baginski, M. Bozack, C. Ellis, G. Flowers, R. W. Johnson, N. Schutz, Y. Tzeng, and S. Wentworth, "Microsystems Research at Auburn University," Workshop on Nano and Microsystems Technology and Metrology, Huntsville, AL, Dec 4-5, 2002.
- C. Ellis, R. Dean, L. Almeida and I. Anderson, "Quad Electrostatic Inchworm Drive Optical Actuator," Workshop on Nano and Microsystems Technology and Metrology, Huntsville, AL, Dec 4-5, 2002.
- R. Dean, N. Schutz and L. Thomas, "Microsystems and Packaging Applications," Liquid Crystal Polymer Material Processing & Applications Symposium, Huntsville, AL, Oct 29, 2002.
- R. Dean, N. Schutz, L. Thomas and S. Tully, "MEMS Devices in Printed Circuit Board Technology," IMAPS Advanced Technology Workshop on Packaging of MEMS & Related Micro Integrated Nano Systems, Denver, CO, Sept 6-8, 2002.
- B. Farrell, P. Jaynes, D. Kubiak, and R. Dean, "Microfabrication Techniques for Liquid Crystal Polymer Substrates," IMAPS Advanced Technology Workshop on Packaging of MEMS & Related Micro Integrated Nano Systems, Denver, CO, Sept 6-8, 2002.
- R. Dean, R. W. Johnson, H. Garrison, N. Schutz, M. Kranz, B. Bowers, B. Payne and R. Legowik, "Strategies for Successfully Integrating MEMS Die onto Laminate," IMAPS 2002, Proceedings 2002, Denver, CO, Sept. 4-6, 2002, pp. 109-114.
- R. Dean, G. Flowers, S. Hodel, K. MacAllister, R. Horvath, A. Matras, G. Robertson and R. Glover, "Vibration Isolation of MEMS Sensors for Aerospace Applications," Proceedings of the IMAPS International Conference and Exhibition on Advanced Packaging and Systems, Reno, NV, March 10-13, 2002, pp. 166-170.
- R. Dean, H. Garrison, C. Ellis, G. Robertson and N. Schutz, "Micro Machining of LCP for MEMS Applications," LCP Materials Symposium, sponsored by PMTEC and AMCOM, Huntsville, AL, January 17, 2002.
- M. Kranz, R. Legowik, W. Bowers, R. Dean, H. Garrison and N. Shultz, "Micro-Packaging of COTS MEMS for Remote Monitoring Systems," 3rd Advanced Technology Workshop on Packaging of MEMS and Related Micro Integrated Nano Systems, IMAPS, Scotts Valley, CA, Nov. 8-10, 2001.
- R. Dean, C. Ellis, G. Robertson, L. Thomas, N. Schutz, S. Tully and H. Garrison, "MEMS Vacuum Tooling for Handling Micro-Optics," 3rd Advanced Technology Workshop on Packaging of MEMS and Related Micro Integrated Nano Systems, IMAPS, Scotts Valley, CA, Nov. 8-10, 2001.
- R. Dean, A. Matras, L. Thomas, H. Garrison, N. Schutz, K. MacAllister and S. Tully, "A Laminate Based MEMS Accelerometer," 3rd Advanced Technology Workshop on Packaging of MEMS and Related Micro Integrated Nano Systems, IMAPS, Scotts Valley, CA, Nov. 8-10, 2001.
- R. Dean, C. Ellis and H. Garrison, "A Novel Method for Handling MEMS Die," Workshop on Microsystems Technology and Applications, Huntsville, AL, July 2001.

- D. Strembicke, A Werkheiser, R. Dean, R. W. Johnson, "A Novel Flip-Chip Packaging Method for 3-Axis MEMS Accelerometers," IMAPS Advanced Technology Workshop, Packaging and Integration of MEMS & Related Microsystems, Orlando, FL, Nov. 10-12, 2000.
- M. Kranz, B. Bowers, R. Dean, R. Legowik, "Advanced Manufacturing Techniques for Integration of COTS MEMS into Missile Health Monitoring Systems," poster presentation, The Knowledge Foundation, Inc. COTS MEMS Conference, Berkeley, CA, August 3 & 4, 2000.
- S. Pan, H. Garrison, R. W. Johnson, M. Palmer, R. Dean, R. Thompson, and J. Evans, "Conductive Adhesives for Under-the-Hood Automotive Applications," Fifth International High Temperature Electronics Conference, Albuquerque, NM, June 2000.
- D. M. Brown, R. Dean, J. D. Brown "LED Backlight: Design, Fabrication, and Testing," SPIE Vol. 3938, January 2000, pp. 180-187.
- R. Dean, P. Nordine and C. Christodoulou, "A Novel Method for Fabricating 3-D Helical THz Antennas Directly on Semiconductor Substrates," Microwave and Optical Technology Letters, January 20, 2000, pp. 106-111.
- R. Dean, P. Nordine and C. Christodoulou, "A Novel Method for Fabricating 3-D Helical THz Antennas Directly on Semiconductor Substrates," SPIE Vol. 3617, January 1999, pp. 67-77.
- R. Durrett, R. Dean, D. F. McCartney, and E. A. Viveiros, "Interface and Post-Processing Requirements to Insert an Acousto-Optic Range-Doppler Processor into an Advanced Radar Digital Signal Processor," SPIE Vol. 2489, April 1995, pp. 165-176.

PATENTS

- "A Micromachined Device Utilizing Electrostatic Comb Drives to Filter Mechanical Vibrations;" Robert Neal Dean, Jr. and George Timothy Flowers; U.S. patent number: 7355318, issued April 8, 2008.
- "Synthetic Voltage Division to Extend the Stable Operating Range of Parallel Plate and Gap-Closing Actuators;" Robert Neal Dean, Jr. and John Y. Hung; U.S. provisional filed June 8, 2007.
- "Three Dimensional Micromachined Electromagnetic Device and Associated Methods;" Rodney L. Clark and Robert N. Dean, Jr.; U.S. patent number: 6,271,802; issued August 7, 2001.

PROFESSIONAL ACTIVITIES

- Associate Editor, IEEE Transactions on Industrial Electronics.
- Technical Co-Chair for the MEMS Track of the 2008 IMAPS Device Packaging Conference, Scottsdale, AZ, March 17-20, 2008.
- Session chair for "Session TP2: MEMS – Assembly and Packaging Technical Workshop" at the IMAPS International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 20-23, 2006.
- Reviewed conference papers for the IEEE IECON05 conference, Raleigh, NC, Nov. 6-10, 2005.
- Member of the Technical Advisory Committee for the "IMAPS 6th Topical Technology Workshop on Packaging of MEMS and Related Micro-Nano-Bio Integrated Systems," Long Beach, CA, November 18 - 19, 2004.
- Session chair for "Session III - Special Session: "PCB and Polymer for MEMS and Microsystems Packaging," at the IMAPS Advanced Technology Workshop on Packaging of MEMS & Related Micro Integrated Nano Systems, Denver, CO, September 6-8, 2002.

- Robert Dean (invited speaker), “An Introduction to MEMS,” a three-hour short course, 2005 Elements of Mechanical Engineering Conference, Auburn University, AL, Oct. 7, 2005.
- Robert Dean (invited speaker), “An Introduction to MEMS,” a three-hour short course, Center for Advanced Vehicle Electronics semiannual meeting, Auburn University, AL, April 17, 2002.

PROFESSIONAL MEMBERSHIPS

- IEEE
- IMAPS
- SPIE

HONORS AND AWARDS

- Best Paper of Session; R. Dean, R. W. Johnson, H. Garrison, N. Schutz, M. Kranz, B. Bowers, B. Payne and R. Legowik, “Strategies for Successfully Integrating MEMS Die onto Laminate,” IMAPS 2002, Proceedings 2002, Denver, CO, Sept. 4-6, 2002, pp. 109-114.
- Best Paper of Session; R. Dean, G. Flowers, S. Hodel, K. MacAllister, R. Horvath, A. Matras, G. Robertson, and R. Glover, “Vibration Isolation of MEMS Sensors for Aerospace Applications,” Proceedings of the IMAPS International Conference and Exhibition on Advanced Packaging and Systems, Reno, NV, March 10-13, 2002, pp. 166-170.
- Phi Kappa Phi, National Honor Society
- Alpha Theta Chi, Collegiate Honor Society
- Tau Beta Pi, Engineering Honor Society
- Eta Kappa Nu, Electrical Engineering Honor Society