Curriculum Vitae[1]

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Daniel Steven Stutts

Associate Professor
Mechanical and Aerospace Engineering
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EDUCATION

- 1990: Ph.D. in Mechanical Engineering from Purdue University. Thesis title: D. S. "A Study of Horizontal and Vertical Forces Generated by Rolling Tires," Ph.D. Dissertation, Fall, 1990, Purdue University. Major professor: Werner Soedel.
- 1987: Masters of Science in Mechanical Engineering from Louisiana State University. Thesis title: "A Two Dimensional Analysis of the Extensor Fibers in the Human Hand," Masters Thesis, Fall, 1987, Louisiana State University. Major professor: David E. Thompson.
- 1983: Bachelors of Science in Mechanical Engineering with concentration in Electrical Engineering, Louisiana State University.

EMPLOYMENT

- August 1997 - Present: Associate Professor of Mechanical Engineering, Department of Mechanical and Aerospace Engineering, Missouri Univeristy of Science and Technology.
- August 1991 - August 1997: Assistant Professor of Mechanical Engineering, Department of Mechanical and Aerospace Engineering, Missouri Univeristy of Science and Technology.

CURRENT AND RECENT RESEARCH

4. "Lunar In-Situ Aluminum Production through Molten Salt Electrolysis (LISAP-MSE)," NASA, Co-PI 03/09/2023 – 12/31/2023.
3. "Using Piezoelectric-driven Ultrasonic Vibrations to Remove Particle Contaminants from Solar Cells," NASA, PI 1/1/2021 – present.
2. "Development of fast and accurate thermal parameter estimation techniques," 8/4/2015 – present.
1. "Development of new ultrasonic actuators surface contaminant removal," 5/1/2016 – 9/30/2017.

[1] Activities during the past five years are highlighted.

JOURNAL PUBLICATIONS

20. Tomanek, Lauren B., and Stutts, Daniel S. "Thermal conductivity estimation via a multi-point harmonic one-dimensional convection model," *International Journal of Heat and Mass Transfer*, Vol. 186, (2022) 122467.

19. Tomanek, Lauren B., and Stutts, Daniel S. "Data on the Validation to Determine the Material Thermal Properties Estimation Via a One-Dimensional Transient Convection Model," *Data In Brief*, Vol. 40 (2022) 10763.

18. Tomanek, Lauren B., Stutts, Daniel S., Pan, Tan, and Liou, Frank, "Influence of Porosity on the Thermal and Electrical Conductivity of Selective Laser Melted Stainless Steel," *Additive Manufacturing*, Vol. 39, March 2021, 101886.

17. Tomanek, Lauren B., and Stutts, Daniel S., "Material Thermal Properties Estimation Via a One-Dimensional Transient Convection Model," *Applied Thermal Engineering*, Volume 184, 5 February 2021.

16. Al Dushaishi, Mohammed F. and Stutts, Daniel S., "Vibration analysis of simultaneous drilling and reaming BHA," *Journal of Petroleum Exploration and Production Technology*, 2020.

15. Rezaei, Hossein, Khilkevich, Victor, Yong, Shaohui, Stutts, Daniel S., and Pommerenke, David, "Mechanical Magnetic Field Generator for Communication in the ULF Range," *IEEE Transactions on Antennas and Propagation*, 2020, Vol. 68, No. 3

14. Al Dushaishi, Mohammed F. and Nygaard, Runar and Stutts, Daniel S., "An Analysis of Common Drill Stem Vibration Models," *ASME Journal of Energy Resources Technology*, 2018, January, Vol. 140, (available online DOI: 10.1115/1.4037682), pp. 012905-1 – 012905-12.

13. Sen Yang, Wei Wu, Shuai Xu, Yaojiang Zhang, Daniel Stutts, and David Pommerenke, "A Passive Intermodulation Source Identification Measurement System Using Vibration Modulation Method," *IEEE Transactions on Electromagnetic Compatibility,* 2017, Vol. 59(**6**),pp. 1677 - 1684.

12. Al Dushaishi, Mohammed F. and Nygaard, Runar and Stutts, Daniel S., "Effect of drilling fluid hydraulics on drill stem vibrations," *Journal of Natural Gas Science and Engineering*, 2016, Vol. 35, Part A, pp. 1059–1069.

11. Mahesh S. Shetty, Lokeswarappa R. Dharani, Jun Wei, and Daniel S. Stutts, "Failure probability of laminated architectural glazing due to combined loading of wind and debris impact," *Engineering Failure Analysis*, 2014, Vol. 36, pp. 226-242.

10. Mahesh S. Shetty, Jun Wei, Lokeswarappa R. Dharani, and Daniel S. Stutts , "Analysis of Damage in Laminated Architectural Glazing Subjected to Wind Loading and Windborne Debris Impact", *Buildings*, 2013, Vol. 3, No. 2, pp. 422-441.

9. A. Heckman, J. Rovey, K. Chandrashekhara, S. Watkins, R. Mishra, and D. S. Stutts, "Structural Health Monitoring Data Transmission for Composite Hydrokinetic Turbine Blades," *AIP Journal of Renewable and Sustainable Resources*, *Advanced Shipping and Ocean Engineering*, 2013, Vol. 2, No. 2, pp. 43-49.

8. Shetty, M. S. and Dharani, L. R. and Stutts, D. S., "Analysis of Laminated Architectural Glazing Subjected to Wind Load and Windborne Debris Impact ", *ISRN Civil Engineering*, 2012, 9 pages.

7. Beccue, P., Neely, J., Pekerak, S. and Stutts, D. S., "Measurement and Control of Torque Ripple-Induced Frame Torsional Vibration in a Surface Mount Permanent Magnet Machine," *IEEE Transactions of Power Electronics.*, Vol. 20, No. 1, January 2005.

6. Beccue, P., Neely, J., Pekarek, S., and D. S. Stutts, "Utilization of a Piezoelectric Polymer to Sense Harmonics of Electromagnetic Torque," *IEEE Power Electronics Letters*, Sept. 2003, Vol. 1, No. 3, pp 69-73.

5. Friend, J. R., S. Jun, K. Nakamura, S. Ueha, and D. S. Stutts, "A Single-Element Tuning Fork Piezoelectric Linear Actuator," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, Vol. 50, No. 2, February 2003, pp. 179-186*

4. Friend, J. R., Stutts, D. S. "The Dynamics of an Annular Piezoelectric Motor Stator ," *Journal of Sound and Vibration.* (1997) **204**(3), 421-437.

3. Stutts, D. S., Krousgrill, C. M, Soedel, W. "Fore-and-Aft Forces in Tire-Wheel Assemblies Generated by a Stiffness Nonuniformity and the Influence of Parametric Excitation," *Journal of Sound and Vibration.*, (1995) Vol. 179 (3) 499-512.

2. Stutts, D. S., Soedel, W. "A Simplified Dynamic Model of the Effect of Internal Damping on Rolling Resistance in Pneumatic Tires," *Journal of Sound and Vibration.* (1992) 155 (1), 153-164.

1. Stutts, D. S., Soedel, W. "Fore and Aft Forces In Tire-Wheel Assemblies Generated by Unbalances and the Influence of Balancing," (1991) *Tire Science and Technology* 19 (3) 142-162.

PATENTS

1. US Patent No. 7,117,754 "Torque Ripple Sensor and Mitigation Mechanism," Inventors: J. Neely, S. Pekarek, and D. S. Stutts.

CONFERENCE PAPERS

13. Jiang, C., Stutts, D.S., Hu, M. and Jin, L., 2012, October. Contact model of a ring-type traveling wave ultrasonic motor. In 2012 15th International Conference on Electrical Machines and Systems (ICEMS) (pp. 1-5). IEEE.

12. A. Heckman, J. Rovey, K. Chandrashekhara, S. Watkins, R. Mishra, and D. S. Stutts "Ultrasonic Underwater Transmission of Composite Turbine Blade Structural Health," Paper #8343-23, *SPIE Smart Structures/NDE 2012, 11-15 March 2012*, San Diego, California, USA.

11. N. Navapan, R. W. Schwartz, D. S. Stutts, and J. A. Wood, "Characterization and Modeling of Local Deformation Response in Stress-Biased Piezoelectric Actuators,"*IEEE International Ultrasonics, Ferroelectrics, and Frequency Control 50th Anniversary Joint Conference*, 24-27 August, 2004, Montréal, Canada.

10. Stutts, D. S., "Innovations in the Senior Mechanical Engineering Systems Laboratory,"*38th ASEE Midwest Regional Section Meeting, Univ. Missouri-Rolla, Rolla, MO, Sept. 10–12, 2003.*

9. Dalton, J. S., Stutts, D. S., Montgomery, R. L.,"Mini-Labs in the Undergraduate Classical Controls Course," *Proc. ASEE Annual Conf. & Exposition, June 23–25, 2003, Nashville, TN*

8. Neely, J. Beccue, P., Pekarek, S. Stutts, D. S., Banaskavich, J. "Design and Construction of a Closed-Loop Controller for the Mitigation of Torque Ripple in a Brushless DC Machine," *2002 SAE Power Systems Conference October 29 - 31, 2002, Marriott Resort, Coral Springs, Florida, Paper Number 02PSC-27.*

7. Friend, J. R., Stutts, D. S. "Design, Optimization, and the Prototyping of a Small Tuning-Fork Ultrasonic Piezoelectric Linear Motor, *1999 IEEE Ultrasonics Conference, Lake Tahoe, NV, October 17-20.*

6. Friend, J. R. and D. S. Stutts "Contact Mechanics in Rotary Piezoelectric Motors," *1997 World Congress on Ultrasonics, Yokohama, Japan.*

5. Cummings, J. R., Stutts, D. S., Dharani, L. R. "An Analytical Composite Model of a Piezoelectric Traveling Wave Motor for Optimal Design and Manufacture," *Design for Manufacturability and Manufacture of Ceramic Components Symposium, American Ceramic Society 96th Annual Meeting, Indianapolis, IN April 24-28, 1994.*

4. Stutts, D. S., Soedel, W., "A Simplified Dynamic Model of the Effect of Internal Damping on Rolling Resistance in Pneumatic Tires," Twenty-Second Midwestern Mechanics Conference, Rolla, MO, October 6-9, 1991

3. Stutts, D. S., Krousgrill, C. M, Soedel, W. "Fore-and-Aft Forces in Tire-Wheel Assemblies Generated by a Stiffness Nonuniformity and the Influence of Parametric Excitation," *Presented at The Tenth Annual Meeting and Conference on Tire Science and Technology, Akron, OH, March 19-20, 1991* – paper No. 18.

2. Stutts, D. S., Soedel, W., Jha, S. K. "Fore and Aft Forces In Tire-Wheel Assemblies Generated by Unbalances and the Influence of Balancing,"*Presented at The Ninth Annual Meeting and Conference on Tire Science and Technology, Akron, OH, March 20-21, 1990* – paper No. 18.

1. Stutts, D. S., Thompson, D.E., "A Muscle Force and Excursion Meter," *Second Annual Southern Biomedical Engineering Conference, San Antonio, Texas, September 26-27, 1983.*

DOCTORAL ADVISEES

5. Zachary Boeringa, Ph.D. Mechanical Engineering, December, 2027 expected.

4. Jeremiah Rittenhouse, Ph.D. Aerospace Engineering, December, 2024 expected.

3. Lauren Tomanek, Ph.D. Mechanical Engineering, May, 2022. (Sandia National Laboratory)

2. Yezad Anklesaria, Ph.D. Aerospace Engineering, 2021 (Assistant Teaching Professor, Mechanical and Aerospace Engineering, Missouri University of Science and Technology: https://mae.mst.edu/faculty-directory/)

1. James R. Friend, Ph.D. Mechanical Engineering, 1998 (Professor of Mechanical Engineering, University of California, San Diago: http://friend.ucsd.edu/james-friend/)

MASTERS ADVISEES

12. John Bromell, MS Mechanical Engineering, Fall 2023 expected.
11. Headman Sanei, MS Mechanical Engineering, 2013
10. Dwight Maness, MS Mechanical Engineering, 2013
9. Qiang Du, (Co-advised with Steve Pekerak) MS Electrical Engineering, 2002
8. Chandra Jonalagadda, MS Mechanical Engineering, 2002
7. Sambuddha Chakraborty, MS Mechanical Engineering, 2001
6. Ronald P. Holland, MS Mechanical Engineering, 1999
5. Jayakumar Chandrashekar, MS Mechanical Engineering, 1996
4. Mark Hall, (Co-advised with Lokesh Dharani) MS Mechanical Engineering, 1996
3. Sherri R. Williams, MS Mechanical Engineering, 1996
2. James R. Cummings, MS Mechanical Engineering, 1994
1. Yi Yun Gao, MS Mechanical Engineering, 1993

INVITED LECTURES AND SEMINARS

7. "My Research in Piezoelectric Actuation and Sensing," Louisiana State University, Department of Mechanical Engineering Graduate Seminar, March 28, 2003.
6. "Visiting Foreign Expert," Peoples Republic of China, June 11 – 24. Gave talks on piezoactuator modeling and development at four universities: Southeast University, Nanjing, Wu Xi University of Light Industry, Wu Xi, Yanzhou University, Yanzhou, and University of Science and Technology of China, Hefei. All expenses paid by PRC.
5. "Recent Developments and Issues in Bio-Absorbable and Bio-Incorporative Internal Orthopedic Fixation," *ASME International Mechanical Engineering Congress & Exposition, November 12 - 17, 1995, San Francisco, CA.*
4. "An Analytical Model of the Operation of a Piezoelectric Traveling-Wave Motor." Smart Actuator Symposium, 1994, ICAT, Penn State October 27, 1994.
3. "An Analytical Composite Model of a Piezoelectric Traveling-Wave Motor," Smart Actuator Symposium, 1994, ICAT, Penn State October 27, 1994.
2. "Irregular Perturbation Methods in Ordinary Differential Equations," Nonlinear Dynamical Systems Seminar, Department of Mathematics, University of Missouri-Rolla, February 5, 1992.
1. "The Dynamics of Nonuniform Tires," Southwestern Bell Engineering Lecture Series, Arkansas State University, November 8, 1990.

SERVICE AND LEADERSHIP

- 2021 – Present, Chairman of the S&T Information Technologies Campus Committee.
- 2019 – Present, Member, Editorial Board, *Vibration*.
- 2019 – Present, Member, CEC Laboratory Safety Committee.
- 2015 – Present, Chairman of the S&T SDELC Board of Directors.
- 2015 – Present, Reviewer for *AIP Review of Scientific Instruments*.
- 2014 – Present, Reviewer for *Applied Physics Letters*.
- 2004 – Present, Reviewer for *IEEE* (various journals).
- 1991 – Present, Reviewer for *Journal of Sound and Vibration*.
- 2010 Performed in Engineers Without Borders Benefit Faculty Talent Show.
- 2009 Performed in Engineers Without Borders Benefit Faculty Talent Show.
- 2003 Redesigned ME242 (Mechanical Engineering Systems Lab) to allow for greater student creativitiy, and communications practice. Reduced student complaints by over 95%.
- 2002 Developed "Mini-Labs" to supplement the ME279 (Control of Mechanical Systems) lecture course.
- Developed and taught ME401 Vibrations of Shells and Plates with Piezoactuation and Sensing.
- 1997 – Session Chair, 1997 ASEE Conference and Exposition, June 14 - 18, Milwaukee, WI.
- 1997 – Session Chair, 1997 SAE International Earthmoving Industry Conference & Exposition April 8 - 10, Peoria Civic Center, Peoria, IL.
- **Co-founded the Electronic Materials Applied Research Center (EMARC) with Harlan Anderson.** Served as Associate Director from 10/1/96 until 9/30/98.
- Served on campus-wide search committee for Vice Chancellor of Administrative Services (1995).
- UMR Formula SAE Team advisor, 8/1/95 – 9/1/02.
- UMR Society of Automotive Engineers advisor. Appointed Winter, 1999.
- Co-founded the UMR Electronic Applied Research Center (EMARC).

- Developed and taught a graduate course (ME401) in nonlinear dynamical systems and chaos.
- Developed a pilot program for the ME undergraduate core courses based on the Supplementary Instruction (SI) program. The program utilizes undergraduate students who have made a grade of B or better in a given course as Supplementary Instruction Leaders (SI-Leaders) for that course. SI-Leaders act as facilitators during help sessions which are open to students currently enrolled in the same course.
- Served as panel member on the ASME International Gas Turbine Institute Scholarship Committee, 11/18/93.
- Served as reviewer and panel member for the National Science Foundation Nov. 21, 1991.
- Reviewer for the Journal of Sound and Vibration.
- 1993 – Session Chair – Midwest Section 28th Annual Meeting ASEE
- 1991 – Session Chair – 22th Midwestern Mechanics Conference

CONSULTING ACTIVITIES

16. 2019 PlayPower, Inc, Huntersville, NC.
15. 2012 – 2019, Texas Instruments, Dallas, TX.
14. 2016 Watlow Electric, St. Louis, MO.
13. 2014 Motor Appliance Corp (MAC), Washington, MO.
12. 2009 Invensys, Inc., Chicago, IL, and West Plains, MO
11. 2007 AVETEC, Inc., Springfield, OH
10. 2007 Crosslink, Inc., St. Louis, MO
9. 2007 Mach Motion, Inc., Newburg, MO
8. 2007 LaBarge Products, Inc., St. Louis, MO
7. 2006 Holtcamp, Liese, et al., Attorneys at Law, St. Louis, MO
6. 2006 Turfline, Inc. Moscow Mills, MO
5. 2006, Gammill Quilting Machine Company, Inc., West Plains, MO
4. 2005, Gammill Quilting Machine Company, Inc., West Plains, MO
3. 2004 Federal Mogul, Inc., Multi-National
2. Medtronic, Inc. (Mini Med), Los Angeles, CA
1. 2003 Dynamic Structures and Materials, LLC, Franklin, TN

OPEN SOURCE PROJECTS (Partial list)

ATMC

Arduino Temperature Monitoring and Control (Arduino C^{++}): https://github.com/dsstutts/ATMC.

Arduino

The Arduino IDE (Java): https://github.com/arduino/Arduino.

EQCIRC3

Equivalent circuit parameter estimator for piezoelectric structures (Python): https://github.com/dsstutts/EQCIRC3.

LMTest

Simple parameter estimation example using the the Levenberg-Marquardt[a] nonlinear least squares algorithm (Python): https://github.com/dsstutts/LMTest.

[a] See: https://en.wikipedia.org/wiki/Levenberg%E2%80%93Marquardt_algorithm.

PROFESSIONAL ORGANIZATIONS

- IEEE
- American Society of Mechanical Engineers
- American Academy of Mechanics
- Louisiana Society of Professional Engineers (EIT 1983)

HONORS

- Stutts, D. S. Missouri University of Science and Technology Experiential Learning Award, 2021.
- 2013 – 2014 Commendation for Teaching Excellence.
- 2010 Teachers Who Made a Difference (*Alumni Association recognition*) [2]
- 2004 UMR Innovative Teaching Award
- 2000-2001 Academy of Mechanical and Aerospace Engineers Faculty Service Excellence Award
- 1995 ASEE Outstanding New Mechanics Educator (*national award*)

CURRENT PROFESSIONAL ORGANIZATIONS

- IEEE
- American Society of Mechanical Engineers
- American Academy of Mechanics
- Louisiana Society of Professional Engineers (EIT 1983)

[2] http://magazine.mst.edu/issues/fall_2009/

PENDING EXTERNAL FUNDING

1. "Validating Measures of Teaching Effectiveness," NSF, Co-PI (10%) with Devin Burns $399,167.00, 01/01/2024 – 12/31/2026 .

EXTERNAL FUNDING (PI or Co-PI on approximately $4,245,752.00 total in external research or development grants to date with shared credit of approximately $4,155,751.00)

22. "Lunar In-Situ Aluminum Production through Molten Salt Electrolysis (LISAP-MSE)," NASA, *NASA Big Ideas Competition*, Co-PI (15%) with Daoru Han $160,676.00, 03/09/2023 – 12/31/2023 .

21. "Using Piezoelectric-driven Ultrasonic Vibrations to Remove Particle Contaminants from Solar Cells," *NASA Big Ideas Competition*, PI (51%) with Fatih Dogan $179,999.00, 1/1/2021 – 11/30/2021.

20. "Boeing-S&T Cooperative Service Agreement," *Boeing*, PI (100%) $2,341,652.00, 08/01/2020 – 07/31/2025.

19. "Development of new ultrasonic actuators surface contaminant removal," *Texas Instruments*, PI (100%) $147,277.00, 5/1/2016 – 9/30/2017.

18. "Design and modeling of novel piezoelectric actuators and transducers, vibration-based detection of PIM, mechanically-based antennas (AMEBA), and integration of embedded systems for sensing and control," *Hauwei Technologies*, Co-PI (5%) with David Pommerenke PI $90,000.00, 8/4/2015 – 8/4/2016.

17. "Piezoactuator modeling and ultrasonic motor control", *Texas Instruments* Unrestricted Academic Gift, PI(100%) $65,000.00, 11/23/2015.

16. "Development of novel real-time health monitoring and control of ultrasonic traveling wave motors," *Texas Instruments* Unrestricted Academic Gift, PI (100%) $65,000.00, 8/22/2014.

15. Stutts, D. S. "Development of an Ultrasonic Bone Saw," *DePuy Orthopaedics, a Johnson&Johnson Company*, $154,336.00 7/1/00 – 12/31/01.

14. Stutts, D. S. Wilkerson R. (50%) "Re-Implementation of I-Conduit Tool Set," *Centcom, Inc.* ($28,750 in-kind) and MRTC ($25,000). Duration: 8/15/00 – 7/31/01.

13. Anderson, H. U. (PI - 75%) and Stutts, D. S.(Co-PI – 25%) "Electronic Materials Applied Research Center," *Missouri Department of Economic Development*, $150,000 from 10/1/97 - 9/30/98.

12. Stutts, D. S. (PI) (PI - 50%), and Huebner, W. (Co-PI – 50%), "The Traveling-Wave Motor – Analysis and Design Optimization," *AlliedSignal Aerospace*, $140,704.00, Duration: 5/1/97 – 4/30/98.

11. Stutts, D. S. (PI), "Analytical Modeling of an Ultrasonic Traveling Wave Motor for Design Optimization," *National Science Foundation*, $93,603. Duration: 8/1/94 - 8/1/98.

10. Anderson, H. U. (PI - 50%) and Stutts, D. S.(Co-PI – 50%) "Electronic Materials Applied Research Center," *Missouri Department of Economic Development*, $150,000 from 10/1/96 - 9/30/97.

9. Huebner, W. (PI - 50%),and Stutts, D. S. (Co-PI – 50%),, "Analytical Modeling of Ultrasonic Traveling Wave Motors," *National Science Foundation*, $22,500. Duration: 7/1/96 - 12/31/96.

8. Stutts, D. S. (PI – 80%), and Huebner, W. (20%), "The Traveling-Wave Motor – Analysis and Design Optimization," *AlliedSignal Aerospace*, $209,714 ($164,697 + $45,017 MRTC Match). Duration: 5/1/96 - 5/1/97.

7. Stutts, D. S. (PI – 80%), and Huebner, W. (20%), "The Traveling-Wave Motor – Analysis and Design Optimization," *AlliedSignal Aerospace*, $152,879 ($102,879 + $40,000 MRTC Match). Duration: 5/1/95 - 5/1/96.

6. Stutts, D. S. (PI – 80%), and Huebner, W. (20%), "The Traveling Wave Motor – Analysis and Design Optimization," *MRTC* $24,999. Duration: 8/1/94 - 6/31/95.

5. Stutts, D. S. (PI – 80%), and Huebner, W. (20%), "The Traveling Wave Motor – Analysis and Design Optimization," *AlliedSignal Aerospace*, $88,148. Duration: 1/1/94 - 12/31/94.

4. Stutts, D. S. (PI), "Analytical Modeling of an Ultrasonic traveling Wave Motor for Design Optimization, " *National Science Foundation*, $93, 603. Duration: 1/8/94 - 7/31/97.

3. Stutts, D. S., "Orthopedic Fixation Using Cortical Bone Fasteners," *University of Missouri Research Board*, $31,869. Duration: 1/1/94 - 12/31/95.

2. Stutts, D. S. (PI – 80%), and Huebner, W. (20%), "The Traveling Wave Motor – Analysis and Design Optimization," *AlliedSignal Aerospace, $67,500 ($45,000 + $22,500 MRTC match).* Duration: 1/1/93 - 12/31/93.

1. Stutts, D. S. (PI) "SLU/UMR Joint Study of the Use of Cortical Bone Pins for Fixation of Fractures in the Wrist and Hand," *St. Louis University Medical School* $5000 for support of undergraduate research assistant Duration 5/15/92 - 8/15/92.

DEVELOPMENT GRANTS and IN-KIND DONATIONS

13. 2023 One (1) Proton Non-Contact Laser Measuring System, Model No: S12550. Original date of purchase: July 2006. Approximate cost: $6000, Leggett & Platt, Inc.

12. 2023 Four (4) - Celtron S00lb Capacity Load Cells (new–never used) Model No: SQB-500. Original date of purchase: June 2001. Approximate cost: $2000, Leggett & Platt, Inc.

11. 2019 $10,000.00, Corning Glass, Inc., for graduate student support.

10. 2015 $4,000.00, Stutts Research and Development, LLC, for graduate student support.

9. 2014 PCB Piezotronics, Inc. $5,388.00 in kind, vibrations measurement equipment.

8. 2013 $900.00, Stutts Research and Development, LLC, for laboratory development.

7. 2009 Microcontroller parts and development equipment $5,000.00 in kind, *Microchip.*

6. 2004 $3000.00, Stutts Research and Development, LLC., graduate student support .

5. Two Lindberg high-temperature furnaces valued at $10,000.00. Caterpillar, Inc.

4. Equipment for FSAE Research and Development from the General Motors Proving Ground (PI) – 5/30/96. Approximate value: $6,700.00

3. Stutts, D. S., (PI) "A Portable Electromechanical Analog Control Laboratory," *AlliedSignal Aerospace*, $500. (For support of ME261 project) Duration: 1/10/94 - 5/14/94.

2. Stutts, D. S., (PI) "Design of a tension measuring mechanism for assembly of a Traveling Wave Motor," *AlliedSignal Aerospace*, $500. (For support of ME261 project) Duration: 8/21/93 - 12/14/93

1. Stutts, D. S.,(PI) "Design of a tension-measuring mechanism for assembly of a Traveling Wave Motor," *AlliedSignal Aerospace*, $500. (For support of ME261 project) Duration: 1/10/93 - 5/14/93.