

Curriculum Vitae

Dr. Charlene Birdsong, Ph.D.

Professor Mechanical Engineering Department
California Polytechnic State University
San Luis Obispo, CA 93407
(805) 756-1261
E-mail: cbirdson@calpoly.edu

California Polytechnic State University, San Luis Obispo

Full Professor	2013–Present
Associate professor	2008 – 2013
Assistant Professor	2003–2008

Educational Preparation

Ph.D. Mechanical Engineering

1999

Michigan State University, East Lansing, Michigan Advisor: Clark Radcliffe, Focus: System Analysis and Controls, Active Noise Control. Dissertation topic: Active Noise Control with a Semi Active Helmholtz Resonator

M.S. Mechanical Engineering

December 1996

Michigan State University, East Lansing, Michigan

Advisor: Clark Radcliffe, Focus: System Analysis and Controls, Active Noise Control

B.S. Mechanical Engineering

June 1991, graduated Cum Laude

California Polytechnic State University at San Luis Obispo, California

Graduate School Activities: ME, Michigan State University (MSU)

9/94 – 5/99

A Semi-Active Helmholtz Resonator for an Acoustic Duct, Ph.D. topic. Developed active noise control technology to quiet tonal noise in ducted systems. Study used system modeling and identification to develop a controller design and implementation, sensor actuator instrumentation, analog/digital signal processing, and experimental proof of concept.

Manufacturing Research Consortium at Michigan State University (MRC) & Visteon Automotive. Industrial project with MRC and Visteon Automotive to develop active noise control for quieting industrial airborne noise in manufacturing environment. Included noise characterization, design of noise control solution, and experimental proof of concept, piezoceramic actuator control, controller design, and real-time digital signal processing.

Electro-Mechanical Acoustic Actuator for an Acoustic Duct, M.S. topic. Included Bond Graph modeling theory, control design, analog/digital signal processing and real time control, and experimental acoustic measurements system to implement active noise control.

Software development and data acquisition and control tools. Coded applications using Lab View software for digital data acquisition, control, and hardware control, GPIB communications protocol, A/D converters, and digital I/O. Consulted on web based Lab View Control Lab project for Mechanical and Electrical Engineering cooperative project. Developed software for use in the undergraduate Vibrations and Controls laboratories at MSU.

Developed code in MATLAB environment for Statistical Energy Analysis (SEA) modeling tool “Engineering Acoustic Response” (EAR+) Software. Also developed database and data comparison procedures for SEA model results.

Consultant for undergraduate controls and vibrations laboratories 9/97 – 12/97
Responsible for training new laboratory teaching assistants and supervisors to provide continuous quality in undergraduate Controls and Vibrations laboratories.

Teaching assistant supervisor undergraduate controls laboratory 9/95 – 9/97
Managed Undergraduate Controls Labs. Managed up to 6 graduate teaching assistants per semester. Scheduled and managed as many as 8 sections per semester, acted as mediator between students and faculty representative during disputes. Managed grade databases for 70+ students. Revised and authored new laboratory manuals. Maintained, repaired, and appropriated new laboratory hardware. Managed and authored new software for laboratory experiments including Labview, Matlab, Simulink, Real Time Toolbox for rapid prototype of digital signal processors, Mathematica, and various other software tools.

Teaching assistant – lecturer for undergraduate controls course 6/96 – 9/96
Instructor for senior level, undergraduate Automatic Controls course. Reported directly to department chairman. Prepared lectures, wrote exams, and homework assignments. Graded exams and reported final grades. Managed 6 teaching assistants for the course lab. Initiated and authored course information web page.

Teaching assistant undergraduate automatic controls laboratory 9/94- 9/95
Instructed multiple laboratory sections including lecturing course material, instructing and guiding students in experimental procedures, long form reports, and grading quizzes and reports.

Teaching assistant for undergraduate vibrations laboratory 9/93 - 9/94
Instructed multiple laboratory sections including lecturing course material, instructing and guidance in experimental procedures, long form reports, and grading quizzes and reports.

Guest lecturer for systems dynamics course 1996-1999
Guest lecturer for senior level undergraduate courses including, System Modeling - Bond Graph Modeling Techniques for Dr. Ronald Rosenberg, Theory of Vibrations for Dr. Micheal Hales, and graduate level Digital Data Acquisition (Mechatronics) for Dr. Clark Radcliffe.

Computer Administration 1995 – 1999
Web Page Authoring and Server Management for department information systems. Authored the

Dynamic Systems Laboratory web site including the technical paper archive. Managed the local area network which included 15 computers in graduate and undergraduate laboratories.

Employment History

DACTRON INC. Milpitas, California 4/00 – 12/02
Product Manager: Developed and brought to market new digital signal analysis and vibration shaker control products including product specification, packaging, design, software, and user interface. Developed training and marketing material including user manuals, marketing material and technical papers. Administered customer and sales training seminars. Research and development of new technologies and methods. Provided support for customers in automotive, aerospace, electronics, military, independent laboratory, consulting industries.

TAMARHOFF ASSOCIATES Alexandria, Virginia 2/94 – 7/94
Computer Instructor: Taught computer program use to a variety of professional personnel. Software included word processing, spreadsheet and database programs.

MACHINE DEVELOPMENT COMPANY INC. Dublin, California 5/93 – 9/93
Project Engineer - Machine design of custom automated packaging equipment, prepared assembly, detail, electrical schematics, and panel layout drawings on AUTOCAD, wrote operation manuals and programmed programmable logical controllers.

RADIAN CORPORATION Walnut Creek, California 7/91 – 5/93
Environmental Engineering Consultant - Managed \$2.5 million site cleanup project, supervised subcontractors, performed computer statistical analysis, budget preparation, regulation analysis, technical report writing and editing, and administered Novell network.

CAL POLY and BUCKNER IRRIGATION, San Luis Obispo, California 3/91 – 7/91
Senior Design - Designed automated manufacturing station for plastic sprinkler manufacturer in a team effort. Design involved pneumatic logic and precision sonic welding. Produced final analysis, report, and working drawings.

COMPUTER AIDED PRODUCTIVITY CENTER – CAL POLY San Luis Obispo 3/89 – 7/91
Teaching Assistant - Assisted students in CADAM, CATIA, CAEDS, CBDS and several other CAD and engineering design related computer software packages.

APPLIED MAGNETICS Goleta, California 8/88 – 3/89
Cad Drafting CO-OP - Designed and produced documentation for tooling in magnetic head production. Logged 800 hours on CADAM system. Designed a test stand for quality assurance.

DOW CHEMICAL Walnut Creek, California 7/86 – 8/88
Engineer Intern (6/88 – 8/88) - Designed and constructed test stand for research and development gas separation modules involving computer controlled valve systems and data collection.

Lab Technician (7/86 – 9/87) - Designed and performed mechanical and environmental tests on R&D plastic optical fiber.

Professional Membership and Registrations

American Society of Engineering Educators, members since 2007

American Society of Mechanical Engineers, member 1990 – present; Vice President of San Luis Obispo Student Chapter, 1990-91; judge for ASME senior design projects at MSU 1996-99; consulted on MSU winning Mars Rover project which advanced to the national final competition, 1999

Tau Beta Pi, Secretary of San Luis Obispo Student Chapter, 1990-91 Student Chapter Advisor 2005-present.

Pi Tau Sigma, Secretary and founding member of San Luis Obispo Student Chapter 1990-91, Student Chapter Advisor 2005-present.

Publications

Reviewed Journal Publications

Birdsong, C., et al. "Student Acceptance of Online Textbooks Across Multiple Engineering Courses." *Computers in Education*, XXV, no. 3, July 2015

Davis, J., Birdsong, C., Cota, H., "Vibroacoustic Study of Circular Cylindrical Tubes Pertaining to Coaster Rails," *Noise Control Eng. J.* 59 (4), July-Aug 2011

Birdsong, C., and Radcliffe, C. J., 1999, "A Compensated Acoustic Actuator for Systems with Strong Dynamic Pressure Coupling," *Journal of Vibrations and Acoustics*, Vol. 121, pp. 89-94.

Reviewed Conference Publications

Birdsong, C., "From 'system modeling' to 'controller hardware testing' in three hours: a robotic arm controller design lab using MATLAB Real Time Windows Target to reinforce classical control theory." ASEE Annual Meeting, Seattle, Washington June 2015

Roussel, S*., Porumamilla, H., Birdsong, C., and Schuster, P., "Modeling of Vehicle Magnetic Footprint in 3-D Space for Type Detection." ASME 2012 International Mechanical Engineering Congress and Exposition, Volume 11: Transportation Systems, Houston, Texas, USA, 2012

Birdsong, "Using Automotive Safety in a Service-Learning Project for Undergraduate Dynamics," Society of Engineering Educators Annual Meeting, 2012, San Antonio, Texas, USA

Chen, J., Victorino, C., Birdsong, C., Menon, U., "A Study of Online Textbook Use across Multiple Engineering Courses," ASEE Annual Meeting, Vancouver BC, June 2011

Roussel, S*., Proumamilla, H., Birdsong, C., Schuster, P., Clark, C., "Enhanced Vehicle Identification Utilizing Sensor Fusion and Statistical Algorithms," IMECE2009-12012, November 13-19, 2009, Lake Buena Vista, Florida, USA

Self, B., Birdsong, C., "A New Spin on Teaching 3D Kinematics and Gyroscopic Motion," AC 2008-1437, ASEE Annual Meeting 2008

Gearhart, C., Herold*, A., Self, B., Birdsong, C., Slivovsky, L., "Use of Ultrasonic Sensors in the Development of an Electronic Travel Aid," IEEE Sensor Applications Symposium

Birdsong, C., "Developing a MATLAB/Simulink RTWT Based Hydraulic Servo Control Design Experiment," American Society of Engineering Educators World Conference, Honolulu, Hawaii, June 2007

Desrosiers, D*., Birdsong, C., Schuster, P., "Using the Pre-Crash Simulator to Develop a Vehicle Collision Prediction Algorithm," Fifth IFAC Symposium on Advances in Automotive Control, paper number AAC07-042, Monterey, California, August 2007

Birdsong, C.B., Schuster, P., "Research in the Undergraduate Environment," Paper Number 2006-1447, American Society for Engineering Educators, 2006 Annual Conference and Exhibition, Chicago, June 2006

Birdsong, C.B., Schuster, P., Carlin, J*, Kawano, D*, Thompson, W*., "Test Methods and Results for Sensors in a Pre-Crash Detection System," Paper Number 06AE-19, SAE World Congress April 2006

Carlin, J*, Birdsong, C.B., Schuster, P., Kawano, D*, Thompson, W*., "Evaluation of Cost Effective Sensor Combinations for a Vehicle Pre-Crash Detection System," SAE Commercial Vehicle Engineering Congress and Exhibition Nov, 2005

C. B. Birdsong, "An Integrated Measurement to Road Vibration Simulation System," The Engineering Integrity Society, Simulation, Test & Measurement Group Conference October, 2001, Birmingham, UK.

C. B. Birdsong, et. al. "A New Portable PC Driven Dynamic Signal Analyzer," 2001 SAE Noise & Vibration conference & Exposition, Traverse City, Michigan.

C. J. Radcliffe and C. B. Birdsong, "An Electronically Tunable Resonator for Noise Control," 2001 SAE Noise & Vibration conference & Exposition, Traverse City, Michigan.

Birdsong, C., and Radcliffe, C., 2000, "Comparison of Two Acoustic Actuators in a Semi-Active Helmholtz Resonator," 2000 ASME International Mechanical Engineering Congress and Exposition, Orlando, Florida, AD-Vol. 61, pp. 179–186.

Birdsong, C., and Radcliffe, C., 1997, "A Smart Helmholtz Resonator," International Mechanical Engineering Congress & Exposition, Active Noise Control - Work in Progress Conference, Dallas, Texas

Birdsong, C., and Radcliffe, C., 1997, "Development of a Comparison Index and a Database for Statistical Energy Analysis Model Results," SAE Noise and Vibrations Conference & Exposition, Traverse City, Michigan

Birdsong, C., Byam, B, and Radcliffe, C., "Software and Database Development for Statistical Energy Analysis Modeling Software," submitted to Institute of Automotive Engineering, Daewoo, Korea, 1996

Birdsong, C., Radcliffe, C., and Goenka, L., 1999, "Active Noise Control for Visteon Nozzle System," submitted to Visteon Automotive, ETC Division

Poster Sessions

"Truck Crash Avoidance Project," Birdsong, Schuster, Porumamilla, Roussel, et. al. Transportation Research Board 88th Annual Meeting, January, 2009, Washington, D.C

Magazine, Periodicals and Web Articles

“Undergraduate Engineers Develop Hydraulic Servo Control Systems Using Model-Based Design with Simulink,” Birdsong, Mathworks Digest Academic Edition February 2009

C. B. Birdsong, et. al, ”Focus on the job in hand. When USB 2.0 technology is employed in test and measurement signal analyzer hardware, life can become so much more simple,” Testing Technology International Magazine, November 2002

Note: student authorship or co-authorship is indicated with the use of an asterisk.

Funded Grants

Deep Learning for Truck Backup Systems, 2017

Date of Grant: January 2018

Length of Award: 12 months

Role: PI

Sponsor: Daimler

Award Amount: \$33,000

Summary: Apply adaptive control and deep learning to develop a class-8 truck automatic backup driver assistance control system. Supported 2 MS students.

Scaled Class 8 Truck Development, 2017

Date of Grant: January 2018

Length of Award: 12 months

Role: PI

Sponsor: Daimler, 2017

Award Amount: \$12,500

Summary: Develop a 10th scale working model of a class-8 semi truck including, tractor and trailer chassis, drive, suspension, steering, and sensors. Supported 8 students in senior project course.

ESV Student Design Competition Support for uLaren Team, 2017

Date of Grant: May 2017

Length of Award: 6 months

Role: PI

Sponsor: US Department of Transportation

Award Amount: \$2000

Summary: Developed a 10th scale autonomous car for an undergraduate level course in intelligent vehicles. Supported 4 multidisciplinary engineering undergraduate students in senior project. Students presented at ESV conference in Detroit and won runner up in the international student design competition.

Hardware Development for Collision Avoidance, 2017

Date of Grant: January 2017

Length of Award: 9 months

Role: PI

Sponsor: Daimler

Award Amount: \$32,000

Summary: Developed mobile autonomous pedestrian and automobile targets to be used for testing semi-trucks with advanced driver assistance systems. Supported 12 undergraduate students in senior project course.

ESV Student Design Competition Support for Avoidtronics Team, 2015

Date of Grant: May 2015

Length of Award: 6 months

Role: PI

Sponsor: US Department of Transportation

Award Amount: \$2000

Summary: Developed a 10th scale autonomous vehicle with collision avoidance capability. Supported 3 undergraduate students in senior project course. Students presented their work at the ESV conference in Seoul Korea and won first place in the student design competition.

Low Cost Collision Avoidance, 2013

Date of Grant: January 2013

Length of Award: 12 months

Role: PI

Sponsor: Gas Technology Institute

Award Amount: \$112,000

Summary: Developed an aftermarket sensor device that detects magnetic fields to identify the presence of obstacles near the host vehicle. Supported 3 undergraduate and 1 masters student.

Graduate Students

Master's Students that I Advised

- Journey McDowel, in progress, Deep Learning for Truck Backup Advanced Driver Assistance Systems
- Kevin Gasik, in progress, Class 8 Semi Tractor Trailer Vehicle Dynamic Simulation
- Nick Bonafide, in progress, Olympic Luge Track Dynamic Model
- Thomas Stevens, completed 2014, Hardware in the Loop Simulator for a Collision Avoidance Vehicle
- Shawn Hampton, in progress, Low Cost Magnetic Collision Avoidance Sensor
- Jan Michielsen, international exchange MS student completed 2013 at Department Industriële Wetenschappen en Technologie, Belgium on Crash Avoidance Path Planning using Artificial Potential Fields
- Tim Bruers, international exchange MS student completed 2013 at Departement Industriële Wetenschappen en Technologie, Belgium on Analysis of a tenth scale vehicle dynamic model - comparing a 8 degree of freedom model with a high-order model (CarSim)

Master's Committees

- Brandon Stell, completed 2017, (committee member), Olympic Luge Steel Ice Interaction Modeling
- Kato Tomoyuki, completed 2014 (committee for Aero student), Modification of the Cal Poly Spacecraft Simulator System for Robust Control Law Verification
- Projects Christian W. Lopez, completed 2013, (committee member for Aero MS student) UAV Formation Flight Utilizing a Low Cost, Open Source Configuration
- Spencer Everett Lillywhite, completed 2013 (committee member) Microphone-base pressure diagnostics for boundary layer transition
- Brian Decimo Marchini, completed 2013 (committee member for Aero student), Adaptive Control Techniques for Transition-to-Hover Flight of Fixed-Wing UAVs

Courses Taught

ME 212 Dynamics

ME 410 Experimental Methods

ME 422 Mechanical Control Systems

ME 428/429/430 Senior Design Project

ME 599 Thesis

Smart Vehicles Summer Course Munich, Germany

Vehicle Systems Engineering San Sebastian, Spain