# Curriculum Vitae Timothy A. Doughty

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### **CURRENT APPOINTMENT**

VanGrunsven Professor of Engineering, Mechanical Engineering Donald P. Shiley School of Engineering, University of Portland August 2006 - Present

KEEN Team Lead Donald P. Shiley School of Engineering, University of Portland August 2006 - Present

Co-Director Innovation Minor Donald P. Shiley School of Engineering, University of Portland August 2017 - Present

# **RESEARCH TOPICS**

Nondestructive health monitoring in premonition of mechanical failure through nonlinear system identification and signal processing.

Nonlinear modeling of hand-arm tremor with design and application of a mechanisms for suppression of Parkinsonian hand tremor.

Developing material models for failure in application to vulnerability assessment for U.S. infrastructure.

Pedagogical development for undergraduate mechanical engineering curricula, including aspirational ethics, innovation, entrepreneurial mindset, diversity and inclusion, and hands on learning.

### **EDUCATION**

Ph.D., 2002, Purdue University, West Lafayette, IN Thesis: System Identification of Coupled Modes in Nonlinear Structures. M.S.M.E., 1993, Washington State University, Pullman, WA Thesis: Development and Application of a Leakage Correction Technique for Experimental Nonlinear Study

B.S.M.E., 1991, Washington State University, Pullman, WA Graduated Outstanding Senior

# PREVIOUS EXPERIENCE

Technical Consultant for Acumed, Medical Device Manufacturer, Spring 2016 Design and Feasibility Study in Novel Dynamic Hip Replacement Joint

Faculty Scholar, Lawrence Livermore National Laboratory June 2009 to June 2011 National Security Engineering Division *held Q Clearance* 

Visiting Assistant Professor of Mechanical Engineering, July 2003 to July 2006 Picker Engineering Program, Smith College

Visiting Assistant Professor, August 2002 to August 2003 School of Mechanical Engineering, Purdue University

Graduate Research Assistant, August 1997 to January 1998 School of Mechanical Engineering, Purdue University

Lead Teaching Assistant, January 1994 to May 2002 School of Mechanical Engineering, Purdue University

Teaching Assistant / Laboratory Instructor, August 1991 to August 1993 Mechanical Engineering, Washington State University

# SCHOLARSHIP

- **Doughty T. A.**, Dillon H.E., Lulay K.E., Eifler K.E., and Hensler Z.Y., (2017) Design and Implementation of an Aspirational Ethics Laboratory Course. *Proceedings of the American Society for Engineering Education Annual Conference. Columbus, Ohio.* 
  - $\circ \quad Student \ Researcher: \ Zoe \ Hensler$
- Lulay K.E., Dillon H.E., Eifler K.E., Doughty T.A., Anderson D. and Bastida J.I., (2017) Increasing Engagement in Materials Laboratory with Backward Design and Quadcopters. Proceedings of the American Society for Engineering Education Annual Conference. Columbus, Ohio.
  - Student Researchers: Daniel Anderson, Jose Bastida De Jesus

**Doughty, T. A.**, Johnston, J.R., and Blaser, A.K., "Monitoring the Health of a Cantilever Beam Using Nonlinear Modal Tracking," *Proceedings of the International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Garden Grove, CA February 2017.* 

- o Student Researchers: Jacob Johnston, Alex Blaser
- Doughty T.A., Danforth S.M., Cassidy L.J., and Pendowski N., (2016) Varied System Geometry and Noise Implementation Applied to Nonlinear Model Tracking. *Proceedings of the American Society of Mechanical Engineers International Mechanical Engineering Conference. Phoenix, Arizona. IMECE2016-65987* Student Researchers: Nick Pendowski, Shannon Danforth, Liam Cassidy
- Barr R.D., Pfeiffer C.G., Dillon H.E., and Doughty, T.A., (2016) Building Inclusive
- Undergraduate Project Teams. Proceedings of the American Society of Mechanical Engineers International Mechanical Engineering Conference. Phoenix, Arizona. IMECE2016-65988
  - o Student Researchers: Claire Pfeiffer, Ryan Barr
- Hoffbeck J.P., Dillon H.E., Albright R.J., Lu W., and Doughty, T. A., (2016) Teaching Programming in the Context of Solving Engineering Problems. *Proceedings of* the Frontiers in Education. Erie, PA.
- Dillon H.E., Schmedake N.J., Eifler K.E., Doughty, T. A., and Lulay K.E., (2016) Design of a Curriculum-Spanning Mechanical Engineering Laboratory Experiment. Proceedings of the American Society for Engineering Education Annual Conference. New Orleans, LA.
  - Student Researcher: Nathan Schmedake
- **Doughty, T. A**, Pendowski, N., and Belle-Isle, A., "Experimental Validation of Nonlinear Modal Tracking with Varying Geometries," *Proceedings of the International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Orlando, January 2016.* 
  - Student Researchers: Nick Pendowski, Andrew Belle-Isle
- Lulay K.E., Dillon H.E., Doughty, T. A, Khan K.H., Munro D.S., Murty V.D., Vijlee S.Z., (2015) Implementation of a Design Spine for a Mechanical Engineering Curriculum. Proceedings of the American Society for Engineering Education Annual Conference. Seattle Washington.
- Doughty, T. A., Hector, M., "Numerical Enhancement of Nonlinear Model Tracking for Health Monitoring," *Proceedings of the International Modal Analysis Conference* (*IMAC*) and Exposition on Structural Dynamics, Orlando, February 2015.
  Student Researcher: Mike Hector
- **Doughty, T. A.**, Dally, M., and Bacon, M., "Numerical Enhancement of NMT for Predicting Fatigue Failure," *Proceedings of the International Modal Analysis*

Conference (IMAC) and Exposition on Structural Dynamics, Orlando, February 2014.

- Student Researchers: Matthew Dally, Mikah Bacon
- **Doughty, T. A.**, Heintz, J., and Ishii, M., "Reducing Parkinsonian Hand Tremor with a Novel Dynamic Eating Utensil," *Proceedings of the International Mechanical Engineering Conference and Exposition (ASME IMECE), San Diego, November 2013.* 
  - Student Researchers: Jordan Heintz, Melissa Ishii
- **Doughty, T. A.,** Bacon, M., Dally, M., and Etzel, N., "Nonlinear Model Tracking for Varying System Geometries," *Proceedings of the International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Los Angeles, February 2013.* 
  - o Student Researchers: Nick Etzel, Mikah Bacon, Matthew Dally,
- Doughty, T. A., Higgins, N. S., and Etzel, N., "Nonlinear Model Tracking in Application to Failed Non Destructive Evaluations," *Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Denver, November 2011.* Student Researchers: Natalie Higgins, Nick Etzel
- **Doughty, T. A.** Cited as an expert in field of Nonlinear Dynamics in the article by Morse, P., "Shakedown: an In-Depth Look at Shaker Rig Testing in Motorsport". *Vehicle Dynamics International's Annual Showcase 2011, (pg 48) 42-48.*
- **Doughty, T. A.** and Higgins, N. S., "Nonlinear Parametric Health Monitoring for Vibrating Structures Under Non-Stationary Excitation," *Proceedings of the International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Jacksonville, January 2011.* 
  - Student Researcher: Natalie Higgins
- **Doughty, T. A.** and Bankus, N., "Mechanical Modeling and Design for Reduction of Parkinsonian Hand Tremor," *Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Vancouver, British Columbia, November* 2010.
  - Student Researcher: Nick Bankus
- **Doughty, T. A.**, LeBlanc, M., Glascoe, L. G., and Bernier, J., "Torsion/Compression Testing of Grey Cast Iron for a Plasticity Model," *Proceedings of the SEM Annual Conference & Exposition on Experimental and Applied Mechanics, Indianapolis, June 2010.*
- **Doughty, T. A.**, and Higgins, N. S., "Effect of Nonlinear Parametric Model Accuracy in Crack Prediction and Detection," *Proceedings of the SEM Annual Conference & Exposition on Experimental and Applied Mechanics, Indianapolis, June 2010.* 
  - Student Researcher: Natalie Higgins

- **Doughty, T. A.** and O'Halloran, S. P. "A Cross Curricular Numerical and Experimental Study in Heat Transfer," *Proceedings of the American Society of Engineering Education Conference (ASEE)*, Louisville, KY, June 2010.
- Doughty, T. A. and Leineweber, M. J., "Investigating Nonlinear Models for Health Monitoring in Vibrating Structures," ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, November 2009.
  Student Researcher: Matt Leineweber
- **Doughty, T. A.**, "Detecting Crack Initiation Through Mapping Nonlinear Parametric Models," *SEM Annual Conference & Exposition on Experimental and Applied Mechanics, New Mexico, June 2009.*
- O'Halloran, S. and **Doughty, T. A.**, "Integration of Numerical Analysis and Experimental Testing Involving Heat Transfer for a Small Heated Cylinder During Cooling," *Proceedings of the American Society of Engineering Education Conference (ASEE), Austin, June 2009.*
- Doughty, T. A., M. Leineweber, "Applying Nonlinear System Identification to Determine Crack Initiation in a Cantilevered Beam," *Murdock College Science Research Conference, Tacoma, November 2008.* Student Researcher: Matt Leineweber
- **Doughty, T. A.**, Davies, P., and Bajaj, A. K., "An Experimental Study of Parametrically Excited Cantilever Beam and System Identification of Nonlinear Models," *ASME Design Engineering Technical Conferences, Chicago, September 2003.*
- Davies, P., Rong, D., Doughty, T. A., and Bajaj, A.K., "Noise Effects in Nonlinear System Identification with Applications to Structures and Systems with Viscoelastic Elements," *IUTAM Symposium on Nonlinear Stochastic Dynamics*, *Monticello IL*, August 2003.
- **Doughty, T. A.**, "System Identification of Modes in Nonlinear Structures," Ph.D. Thesis, Purdue University, West Lafayette, IN, 2002.
- **Doughty, T. A.**, Davies, P., and Bajaj, A. K., "A Comparison of Three Techniques Using Steady-State Data to Identify Nonlinear Modal Behavior of an Externally Excited Cantilever Beam," *Journal of Sound and Vibration, 249(4), 2002, 785-813.*
- **Doughty, T. A.**, Davies, P., and Bajaj, A. K., "An Evaluation of Three Techniques for System Identification of Modes in Nonlinear Structures," *ASD 2000 Advances in Structural Dynamics, Hong Kong, December 2000.*
- P.G. Vaidya, **T. Doughty**, and Rong He "A Study of the Premonitions of Chaos," ASA 124th Meeting, New Orleans, October 1992.

**Doughty, T. A.**, "Development and Application of a Leakage Correction Technique for Experimental Nonlinear Study," Master's Thesis, Washington State University, Pullman, WA 1993.

### PRESENTATIONS

- **Doughty, T. A.**, Johnston, J.R., and Blaser, A.K., "Monitoring the Health of a Cantilever Beam Using Nonlinear Modal Tracking," International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Garden Grove, CA February 2017.
- **Doughty T.A.**, Danforth S.M., Cassidy L.J., and Pendowski N., (2016) Varied System Geometry and Noise Implementation Applied to Nonlinear Model Tracking. Phoenix, Arizona. IMECE2016-65987
- Barr R.D., Pfeiffer C.G., Dillon H.E., and Doughty, T. A. (2016) Building Inclusive Undergraduate Project Teams. American Society of Mechanical Engineers International Mechanical Engineering Conference. Phoenix, Arizona. IMECE2016-65988
- **Doughty, T. A**, Pendowski, N., and Belle-Isle, A., "Experimental Validation of Nonlinear Modal Tracking with Varying Geometries," International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Orlando, January 2016.
- **Doughty, T. A.**, Hector, M., "Numerical Enhancement of Nonlinear Model Tracking for Health Monitoring," *International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Orlando, February 2015.*
- **Doughty, T. A.**, Dally, M., and Bacon, M., "Numerical Enhancement of NMT for Predicting Fatigue Failure," *International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Orlando, February 2014.*
- **Doughty, T. A.**, Heintz, J., and Ishii, M., "Reducing Parkinsonian Hand Tremor with a Novel Dynamic Eating Utensil," *International Mechanical Engineering Conference and Exposition (ASME IMECE), San Diego, November 2013.*
- **Doughty, T. A.,** Bacon, M., Dally, M., and Etzel, N., "Nonlinear Model Tracking for Varying System Geometries," *International Modal Analysis Conference (IMAC) and Exposition on Structural Dynamics, Los Angeles, February 2013.*
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- **Doughty, T. A.**, LeBlanc, M., Glascoe, L. G., and Bernier, J., "Torsion/Compression Testing of Grey Cast Iron for a Plasticity Model," *SEM Annual Conference & Exposition on Experimental and Applied Mechanics, Indianapolis, June 2010.*
- **Doughty, T. A.**, and Higgins, N. S., "Effect of Nonlinear Parametric Model Accuracy in Crack Prediction and Detection," *SEM Annual Conference & Exposition on Experimental and Applied Mechanics, Indianapolis, June 2010.*
- **Doughty, T. A.** and Leineweber, M. J., "Investigating Nonlinear Models for Health Monitoring in Vibrating Structures," *ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, November 2009.*
- **Doughty, T. A.**, Davies, P., and Bajaj, A. K., "An Experimental Study of Parametrically Excited Cantilever Beam and System Identification of Nonlinear Models," *ASME Design Engineering Technical Conferences, Chicago, September 2003.*
- **Doughty, T. A.**, Davies, P., and Bajaj, A. K., "An Evaluation of Three Techniques for System Identification of Modes in Nonlinear Structures," *ASD 2000 Advances in Structural Dynamics, Hong Kong, December 2000.*
- "Designing a New Innovation Minor for the University of Portland", Panel discussion and Workshop with Tim Doughty (UP - Engineering), Jennette Lovejoy (UP -CAS), and Peter Rachor (UP - Franz Center) at Design Week Portland, 2017
- Doughty TA and Dillon HE (2016) Building Inclusive Undergraduate Project Teams. American Society of Mechanical Engineers International Mechanical Engineering Conference. Phoenix, Arizona. November 2016.
- Rachor, P., Doughty TA, Lovejoy, J., and Parkman, I., "The Role of Innovation and Design." Design Week Portland, Portland, April, 2016
- Dillon HE, Doughty TA, Lulay KE, Eifler KE, Schmedake NJ, Anderson DL, and Hensler ZY, (2016) Design of Open-Ended Experiments for Mechanical

Engineering Laboratories. Kern Entrepreneurial Engineering Network Winter Conference.

- Doughty, T. A., "Improving Student Learning through Labs at a T1 School," Presented to the University of Portland Faculty on Faculty Research Day: Research in Pedagogy. Portland, OR, January 2015.
- Doughty, T. A., "Crash Dynamics and Vehicle Safety," Presented to the Beaverton Police Department Management Meeting, Beaverton, OR, April 2014.

# SERVICE

### Service to the Shiley School of Engineering:

VanGrunsven Associate Professor of Mechanical Engineering: Developin	g Value and
Community in Undergraduate Summer Research Projects	2016 - present
KEEN Lead for the University of Portland	2016 - present
Shiley School of Engineering Representative on Innovation Committee	2015 - present
Shiley School of Engineering Representative for NOYCE Grant	2013 - present
Developed and advised annual summer research opportunities regularly lea undergraduate publications and graduate school placement	ading to 2009 -present
Developed Engineering Service Learning Course for Shiley students under directive in partnership with Roosevelt and Astor Schools	r NOYCE 2014 - present
Member of or Chair of the hiring committee for several new Mechanical E Faculty	ngineering 2006 - present
New Faculty Mentor for Drs. Dillon, Vijlee, and Symons	2012 - present
Acting Chair for ME for Ken Lulay while on sabbatical	Fall 2014
Faculty Advisor for Mechanical Engineering Club	2007 to 2015
FE Review presenter for Engineering Mechanics	2007 - present
Lead Instructor for EGR111 for Joe Hoffbeck while on Sabbatical	Spring 2015
Member of the Committee for Common Core EGR 111	
Member of the Engineering Computing Committee	Fall 2016
Developed opportunity for International Undergraduate Research opportun Khalid Khan hosted by Bill Wei in the Netherlands	nity with 2014-2016

### Service to the University:

Co-Director of Innovation Minor (Dean's Council approval)	2017 - present
Member of Ad Hoc Committee reviewing Title IX Policy at UP	2016 - present
Leadership Coach	2015 - 2017
Member of Committee on Academic Relations	2012 - 2015
Member of Teaching and Scholarship Committee	2016 - 2016
Member of Committee on Committees	2017 - present
UP STEM Consultant to LaSalle High School	2011 - present
Mentor to the Honors Program	2010 - present
Member of the Fulbright Campus Committee	2011 - present
Mentor for LXG (League of Extraordinary Gentlemen)	2011 - 2015
Committee Member: Recruitment and Retention	2009 - 2011
Speaker at the Catholic Counselor Weekend	2011
UP STEM Consultant to LaSalle High School	2011
UP Engineering Outreach Host for Camas School District	2010
Liaison to John Orr, Competitive Scholarships	2010 - 2012
Mentor to the Honors Program	2010 - present
Alternate to Academic Senate for Aziz Inan while on sabbatical	2009

### Service to the Professional Community:

ASME Dynamic Systems and Control Conference Editorial Board: two-year term Member of RIGEE review panel for NSF Session organizer for the ASME Technical Committee for Model Identification and Intelligent Systems (MIIS) Session Chair for ASME IMECE 2013 Reviewer for McGraw Hill's Textbook "Vector Mechanics" by Beer and Johnson. Reviewer for Strain: An International Journal for Experimental Mechanics Reviewer for the Journal of Sound and Vibration Reviewer for the Journal of Vibration and Control Reviewer for Experimental Techniques Reviewer for Mechanical Systems and Signal Processing Reviewer for Dynamics Systems and Control Division of ASME Curriculum Vitae: Timothy A. Doughty 9 Reviewer for Educational Research and Methods Division of ASEE

### **PROFESSIONAL MEMBERSHIPS**

Member ASME Technical Committee for Model Identification and Intelligent Systems

Member American Society of Mechanical Engineers

Member Society for Experimental Mechanics

Member American Society for Engineering Education

### GRANTS

- Improving Student Learning with Modern Laboratory Methods, Keck Foundation, (\$250,000) 6/20/2014.
- Noyce Scholars and Interns Program at the University of Portland, National Science Foundation, ((\$1,197,866) 8/31/2012.
- Improving Student Learning with Modern Laboratory Methods, Keck Foundation, 10/25/2013. [Not Funded]
- Educating Engineers in Art Preservation and International Culture, National Science Foundation: IRES, 8/18/2014. [Not Funded]
- Improving Student Learning with Modern Laboratory Methods, National Science Foundation: IRES, 7/1/2013. [Not Funded]
- A Cross Curricular Integration of Data Acquisition for Undergraduate Mechanical Engineers, National Science Foundation: Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES-Type 1), 5/26/2010. [Not Funded: *this became the Keck Foundation Grant w/H Dillon*]

### **AWARDS and HONORS**

"The Difference" Award, University of Portland, 2011

Chosen to give the "Last Lecture" to all graduating seniors, University of Portland, 2010

Selected to SEQUOIA Leadership Training 2014/2015

Butine Faculty Development Fund, Spring 2015. Travel to spring technical conference

Butine Faculty Development Fund, Summer 2009. Development of a temperature controlled chamber for use in cross disciplinary study.

Honorable Mention Best Paper "Development of a temperature controlled chamber for use in cross disciplinary study." American Society for Engineering Education in Mechanical Engineering Division, ASEE Annual Conference, June 2009.

Magoon Award for Outstanding Teaching: awarded for Lecturing, 2002, and for Laboratory Instruction in the years 1997, 1999, 2000, and 2001.

Outstanding Senior: Mechanical and Materials Engineering, Washington State University, 1991