

## **Eric M. Hernandez, Ph.D.**

Associate Professor  
Department of Civil and Environmental Engineering  
College of Engineering and Mathematical Sciences  
University of Vermont

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## **EDUCATION**

- 2004 -2007**                      **Doctor of Philosophy**  
Civil and Environmental Engineering Department  
Northeastern University. Boston, MA. USA  
Dissertation: Applied Observer Theory in Structural Health Monitoring and Diagnosis
- 2002-2004**                      **Master of Science in Civil Engineering - Fulbright Scholar**  
Civil and Environmental Engineering Department  
Northeastern University. Boston, MA. USA
- 1994-1999**                      **Bachelor of Science in Civil Engineering - Magna cum Laude**  
Civil Engineering Department  
Universidad Nacional Pedro Henríquez Ureña. Santo Domingo, Dominican Republic

## **HONORS AND AWARDS**

- Faculty Early Career Development Award (CAREER).* National Science Foundation. 2015
- Outstanding Young Faculty Award.* College of Engineering and Mathematical Sciences. University of Vermont, 2014
- Outstanding Teaching Award.* Civil and Environmental Engineering Department, Instituto Tecnológico de Santo Domingo, 2010
- Outstanding Teaching Assistant Award.* Civil and Environmental Engineering Department, Northeastern University, 2004.
- Fulbright Scholarship.* Department of State of the United States of America, 2002-2004

## **EMPLOYMENT**

- 2017-present**                      **University of Vermont, Burlington, VT**  
**Position:** Associate Professor  
Civil and Environmental Engineering Department  
College of Engineering and Mathematical Sciences

- 2011-2016**                    **University of Vermont. Burlington, VT**  
**Position:** Assistant Professor  
Civil and Environmental Engineering Department  
College of Engineering and Mathematical Sciences
- 2009-2010**                    **Instituto Tecnológico de Santo Domingo (INTEC). Dom. Rep.**  
**Position:** Research Professor-Director of the Center for Infrastructure Science and  
Technology  
Civil Engineering Department  
College of Engineering
- 2007 - 2008**                    **Simpson Gumpertz and Heger Inc. MA. U.S.A**  
**Position:** Senior Engineer  
Engineering Mechanics and Infrastructure Division
- 2006**                            **FM Global. Norwood. MA.**  
**Position:** Summer Research Intern  
Structural Mechanics Research Group
- 2005**                            **FM Global. Norwood. MA.**  
**Position:** Summer Research Intern  
Structural Mechanics Research Group
- 2002 - 2007**                    **Northeastern University. Boston. MA.**  
**Position:** Teaching/Research Assistant  
Civil and Environmental Engineering Department
- 2000 - 2002**                    **Haza y Pellerano. Architects and Engineers**  
**Position:** Structural Quality Control Engineer
- 2000 - 2002**                    **Universidad Nacional Pedro Henríquez Ureña**  
**Position:** Lecturer  
Civil Engineering Department

## **RESEARCH FUNDING**

- 8.) Project Title: Structural Stability and Orbit Uncertainty Analysis using the Fokker-Plank Equation  
Role: Co-Principal Investigator  
Source of Support (Amount): NASA - Vermont Space Grant: (\$25,000)  
Total Award Period Covered: 01/01/17 – 09/31/17
- 7.) Project Title: CAREER: Structural Health Monitoring, Diagnosis and Prognosis of Minimally Instrumented  
Structural Systems  
Role: Principal Investigator  
Source of Support (Amount): National Science Foundation: (\$500,000)  
Total Award Period Covered: 06/1/15 – 05/31/20

- 6.) Project Title: BRIGE: Multiscale Model-Data fusion for Structural Health Monitoring of Fracture Critical Structures  
 Role: Principal Investigator  
 Source of Support (Amount): National Science Foundation: (\$174,965)  
 Total Award Period Covered: 09/1/13 – 08/31/15
  
- 5.) Project Title: Bridge Deterioration Model Based on Inspection Records  
 Role: Principal Investigator  
 Source of Support (Amount): Vermont Transportation Department (\$45,150)  
 Total Award Period Covered: 06/1/14 – 08/31/15
  
- 4.) Project Title: Quantifying the Vulnerability of Vermont Bridges to Seismic Loading  
 Role: Co-Principal Investigator  
 Source of Support (Amount): Vermont Transportation Department (\$214,150)  
 Total Award Period Covered: 06/1/13 – 08/31/16
  
- 3.) Project Title: Statistical Analysis of Weigh-in-Motion Data to Validate Use of HL-93 AASHTO Vehicle Live Load for Bridge Design in Vermont  
 Role: Principal Investigator  
 Source of Support (Amount): Vermont Transportation Department-Federal Highway Adm.: (\$90,124)  
 Total Award Period Covered: 01/1/12 – 12/31/13
  
- 2.) Project Title: Vibration Monitoring and Load Characteristics Evaluation of I-89 Bridges 58 N&S, Richmond – Phase I  
 Source of Support (Amount): Vermont Transportation Department: (\$93,099)  
 Role: Principal Investigator  
 Total Award Period Covered: 06/01/11 – 03/30/12
  
- 1.) Project Title: Vibration Monitoring and Load Characteristics Evaluation of I-89 Bridges 58 N&S, Richmond – Phase II  
 Source of Support (Amount): Vermont Transportation Department: (\$53,098)  
 Role: Principal Investigator  
 Total Award Period Covered: 04/01/12 – 12/31/12

## **PUBLICATIONS**

Underline under a name indicates a student mentored by me.

### **In-Review**

Smith, C.B. and Hernandez, E.M. (in-review) “Detection of spatially sparse damage using impulse response sensitivity and LASSO regularization” Journal of Inverse Problems in Science and Engineering.

Hernandez, E.M. (in-review) “Sensor placement for robust state estimation in structural dynamics” Journal of Mechanical Systems and Signal Processing.

## Peer-Reviewed Journal Publications

- 16.) Hernandez, E.M. (2016) “Efficient sensor placement for state estimation in structural dynamics” *Journal of Mechanical Systems and Signal Processing*. 85(15):789-800
- 15.) Polanco, N., May, G. and Hernandez, E.M. (2016) “Finite Element Model Updating of Semi-Composite Bridge Decks Using Operational Acceleration Measurements” *Journal of Engineering Structures*, 126(1): 264-277
- 14.) Erazo, K. and Hernandez, E.M. (2016) “High-Resolution Seismic Monitoring of Instrumented Buildings” *Journal of Earthquake Engineering and Structural Dynamics*. DOI: 10.1002/eqe.2781
- 13.) Erazo, K. and Hernandez, E.M. (2016) “A Mechanistic Approach to Post-Earthquake Damage Assessment of Instrumented Structures with Uncertain Input” *ASCE Journal of Engineering Mechanics*. DOI: 10.1061/(ASCE)EM.1943-7889.0001114
- 12.) Erazo, K. and Hernandez, E.M. (2015) “Uncertainty Quantification of State Estimation in Nonlinear Structural Systems with Application to Seismic Response in Buildings” *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems*. DOI: 10.1061/AJRUA6.0000837
- 11.) Hernandez, E.M. (2015) “Identification of Localized Structural Damage from Highly Incomplete Modal Information: Theory and Experiments” *ASCE Journal of Engineering Mechanics*. 142 (2): 1-9
- 10.) Hernandez, E.M. and Polanco, N.R. (2015) “A Lower Bound for the Variance of Frequency and Damping Ratio Identified from Noisy Vibration Measurements” *Journal of Structural Control and Health Monitoring*, 23(1):5-19
- 9.) Hernandez, E.M. (2014) “Identification of Isolated Structural Damage from Incomplete Spectrum Information Using  $l_1$ -norm Minimization”. *Mechanical Systems and Signal Processing*, 46(1):59-69
- 8.) Erazo, K. and Hernandez, E.M. (2014) “A Model-based Observer for State and Stress Estimation in Structural and Mechanical Systems: Experimental Validation”. *Mechanical Systems and Signal Processing*, 43(1):141-152
- 7.) Hernandez, E.M. and May, G. (2013) “The Dissipated Energy Ratio as Tool for Earthquake Induced Damage Detection and Classification of Instrumented Structures” *ASCE Journal of Engineering Mechanics*, 139(11), 1521–1529
- 6.) Hernandez, E.M. (2013) “Optimal Model Based State Estimation in Mechanical and Structural Systems”, *Journal of Structural Control and Health Monitoring*, 20(4):532-543
- 5.) Hernandez, E.M. and Bernal, D. (2013) “Iterative Finite Element Model Updating in the Time Domain” *Journal of Mechanical Systems and Signal Processing*, (34)1-2:39-46
- 4.) Hernandez, E.M., Bernal, D. and Caracoglia, L. (2013) “On-line Monitoring of Wind Induced Stresses and Fatigue Damage in Structures” *Journal of Structural Control and Health Monitoring*, 20(10):1291-1302
- 3.) Hernandez, E.M. (2011) “A Natural Observer for Optimal State Estimation in Second Order Linear Structural Systems” *Journal of Mechanical Systems and Signal Processing*, (25)8:2938-2947

- 2.) Hernandez, E.M. and Bernal, D. (2008) "State Estimation in Structural Systems with Uncertain Stiffness and Damping Matrices" *ASCE Journal of Engineering Mechanics*, (134)3:252-258
- 1.) Bernal, D. and Hernandez, E. (2006) "A Data Driven Methodology for Assessing the Impact of Earthquakes on the Health of Building Structural Systems" *The Structural Design of Tall and Special Buildings*, (15)1:21-34

## Books / Book Chapters

- 1.) Hernandez, E.M. (2015) "Post-earthquake Diagnosis of Partially Instrumented Building Structures". Springer Encyclopedia on Earthquake Engineering. Editors: Beer, M., Kougoumtzoglou, I.A., Patelli, E., Au, I.S.-K. pp. 1933-1941

## Technical Reports

- 2.) Hernandez, E.M. and May, G. (2015) Vibration Monitoring of Bridge 58N, 47p. University of Vermont Transportation Research Center.
- 1.) Hernandez, E.M. and Tirk, N. (2014) Statistical Analysis of Weigh-in-Motion Data for Bridge Design in Vermont, 113p. University of Vermont Transportation Research Center.

## Peer-Reviewed Conferences Proceedings

- 29.) Roohi, M., Hernandez, E.M. and Rosowsky, D.V. (2017) "Element-by-element demand-to-capacity ratio estimation from SMRF building seismic records" *Proceedings of the Experimental Vibration Analysis of Civil Structures Conference*, San Diego, CA.
- 28.) Smith, C.B. and Hernandez, E.M. (2017) "Exploiting Spatial Sparsity in Vibration-based Damage Detection" *Proceedings of the International Conference in Modal Analysis*, Orange County, CA.
- 27.) Smith, C.B., Hernandez, E.M. (2017) "Exploiting Spatial Sparsity in Vibration-based Damage Detection". *Proceedings of the 10<sup>th</sup> European Conference in Structural Dynamics*, Sapienza, Rome.
- 26.) Leblanc, B.P., Hernandez E.M. (2017) "Fatigue Usage Monitoring in Wind Turbines Using Sparse Vibration Measurements". *Proceedings of the International Workshop on Structural Health Monitoring*, Stanford, CA.
- 25.) Polanco, N., Hernandez, E.M. (2016) "Kalman Filter Robustness for Fatigue Usage Monitoring". *Proceedings of the American Control Conference*, Boston, MA. pp. 6715-6720.
- 24.) Richards, E., Hernandez, E.M. (2016) "Damping of Cylinder Moving Through Sand". *Proceedings of the International Congress in theoretical and Applied Mechanics (ICTAM)*, Montreal, CA. (digital on CD)
- 23.) Polanco, N., Hernandez, E.M. (2014) "Finite Element Model Updating of Semi-Composite Bridge Decks: Application to Reliability Analysis"\*. *ASCE Engineering Mechanics Conference*, Hamilton, ON. Canada (\* **Best student paper award in structural dynamics**)

- 22.) Erazo, K. and Hernandez, E.M. (2014) “Uncertainty Quantification for State Estimation in Nonlinear Structural Systems”. *Proceedings of the 6<sup>th</sup> International Symposium on Uncertainty Modelling and Analysis*, University of Liverpool, UK. (digital on CD)
- 21.) Hernandez, E.M. and Polanco, N. (2014) “Reliability-based Fatigue Monitoring of Structures”. *Proceedings of the European Workshop in Structural Health Monitoring*, Nantes, France (digital on CD)
- 20.) Hernandez, E.M. (2014) “Use of  $L_1$  Minimization to Detect Localized Damage in structures Using Incomplete Modal Information”. *Proceedings of the IX International Conference on Structural Dynamics (EURODYN 2014)*, Porto, Portugal. (digital on CD)
- 19.) Erazo, K. and Hernandez, E.M. (2014) “Real-time Efficient State Estimation in Nonlinear Structural Systems”. *Proceedings of the IX International Conference on Structural Dynamics (EURODYN 2014)*, Porto, Portugal. (digital on CD)
- 18.) Hernandez, E.M. (2014) “Identification Localized Damage in Structures Using Highly Incomplete Modal Information”. *Proceedings of the XXXII International Modal Analysis Conference IMAC*, Orlando, FL. Vol.5, pp.231-240.
- 17.) Hernandez, E.M. and Polanco, N. (2014) “Uncertainty Quantification in Identified Modal Parameters Using Fisher Information Criterion”. *Proceedings of the XXXII International Modal Analysis Conference IMAC*, Orlando, FL. Vol.3, pp.177-184.
- 16.) Hernandez, E.M. and Erazo, K. (2014) “State Estimation in Nonlinear Structural Systems”. *Proceedings of the XXXII International Modal Analysis Conference IMAC*, Orlando, FL. Vol.2, pp.249-257.
- 15.) Hernandez, E.M. and Erazo, K. (2013) “Nonlinear Model-Data Fusion for Post-Earthquake Assessment of Structures”. *Proceedings of International Workshop on Structural Health Monitoring*, Stanford University, CA. pp. 2704-2711
- 14.) Hernandez, E.M. (2013) “Real-Time Monitoring of Fatigue Reliability of Partially Instrumented Structures Excited by Random Fields”. *Proceedings of the 11<sup>th</sup> International Conference on Structural Safety and Reliability (ICOSSAR2013)*, New York, NY. (digital on CD)
- 13.) Erazo, K. and Hernandez, E.M. (2013) “Experimental Verification of a Finite Element Model Based Functional Observer for Structural Systems”. *Proceedings of the 54th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, Boston, MA (digital on CD)
- 12.) Hernandez, E.M. and May, G. (2013) “Vibration Monitoring and Load Distribution Characterization of I-89 Bridge 58N”. *Proceedings of the XXXI International Modal Analysis Conference (IMAC)*, Orange County, CA. Vol.3, pp.111-118.
- 11.) Hernandez, E.M. (2013), “Quantifying Maximum Achievable Accuracy of Identified Modal Parameters From Noise Contaminated Vibration Data”. *Proceedings of the XXXI International Modal Analysis Conference (IMAC)*, Orange County, CA. Vol.5, pp.75-80
- 10.) Hernandez, E.M. (2013), “Real-time Dynamic Stress Response Estimation at Critical Locations of Instrumented Structures Embedded in Random Fields”. *Proceedings of the XXXI International Modal Analysis Conference (IMAC)*, Orange County, CA. Vol.6, pp. 367-374

- 9.) Hernandez, E.M. and May, G. (2011) “Post-Earthquake Damage Detection in Instrumented Buildings Using Identified Dissipated Energy”. *Proceedings of the XXX International Modal Analysis Conference (IMAC)*, Jacksonville, FL. Vol.6, pp. 351-358.
- 8.) Hernandez, E.M., Bernal, D. and L. Caracoglia (2011) “Output-only Estimation of Wind Induced Stresses in Structures”. *Proceedings of the XXX International Modal Analysis Conference (IMAC)*, Jacksonville, FL. Vol.2, pp. 345-350.
- 7.) Hernandez, E.M. (2011) “Finite Element Model Based State Estimation in Mechanical and Structural Systems”. *Proceedings of the International Workshop in Structural Health Monitoring*, Stanford University, CA. pp.1087-1094
- 6.) Hernandez, E. and Bernal, D. (2007) “State Estimation in Structural Systems in Nonlinear Structural Systems with Model Uncertainties”. *Proceedings of the XXV International Modal Analysis Conference (IMAC)*, Orlando, FL. (digital on CD)
- 5.) Hernandez, E. and Bernal, D. (2006) “An Observer Approach to Model Updating”. *Proceedings of the XXIV International Modal Analysis Conference (IMAC)*, St. Louis, MO. (digital on CD)
- 4.) Bernal, D. and Hernandez, E. (2005) “A Data Driven Methodology for Assessing Impact of Earthquakes on the Health of Building Structural Systems”. *Proceedings of the Seminar on Utilization of Strong Motion Data*, Los Angeles, CA, pp.89-106
- 3.) Bernal, D. and Hernandez, E. (2005) “A Residual Approach for Identifying Damage Induced by Earthquakes”. *Proceedings of the fifth International Workshop on Structural Health Monitoring*, Stanford University, CA, pp. 315-320
- 2.) Bernal, D. and Hernandez, E. (2005) “Identification of Damage Induced by Earthquakes”. *Proceedings of the XXIII International Modal Analysis Conference (IMAC)*, Orlando, FL. (digital on CD)
- 1.) Bernal, D. and Hernandez, E. (2004) “Robust Data Driven Methodology for Damage Detection due to Earthquakes”. *Proceedings of the 13th World Conference on Earthquake Engineering*, Vancouver, BC, Canada. (digital on CD)

## **Conferences Abstracts**

- 14.) Leblanc, B.P. and Hernandez, E.M. (2017) “Fatigue Usage Monitoring in Wind Excited Structures”. ASCE Engineering Mechanics Conference, San Diego, CA.
- 13.) Hernandez, E.M. (2016) “Optimal Sequential Sensor Placement for Fatigue Damage Monitoring of Structures”. *ASCE Engineering Mechanics/ Probabilistic Mechanics and Reliability Conference*, Vanderbilt University, Nashville, TN
- 12.) Polanco, N., Hernandez, E.M. (2016) “Robust Bayesian Fatigue Monitoring of Structures Using Minimal Instrumentation”. *ASCE Engineering Mechanics/ Probabilistic Mechanics and Reliability Conference*, Vanderbilt University, Nashville, TN
- 11.) Erazo, K., Hernandez, E.M. (2015) “A Mechanistic Approach to Seismic Damage Estimation of Instrumented Building Structures Using Bayesian Filtering”. *ASCE Engineering Mechanics Conference*, Stanford University, Palo Alto, CA.

- 10.) Polanco, N., Hernandez, E.M. (2015) “Multi-Scale Stress Usage Monitoring from Global Acceleration Measurements: An Experimental Validation”. *ASCE Engineering Mechanics Conference*, Stanford University, Palo Alto, CA.
- 9.) Erazo, K., Hernandez, E.M. (2014) “Uncertainty Quantification for State Estimation and its Application to Post-Earthquake Damage Assessment”. *ASCE Engineering Mechanics Conference*, Hamilton, ON. Canada
- 8.) Polanco, N., Hernandez, E.M. (2014) “Finite Element Model Updating of Semi-Composite Bridge Decks: Application to Reliability Analysis”. *ASCE Engineering Mechanics Conference*, Hamilton, ON. Canada – BEST STUDENT PAPER AWARD
- 7.) Hernandez, E.M. (2014) “Optimal  $L_p$  Norm for Detection of Localized Damage Using Highly Incomplete Modal Information”. *ASCE Engineering Mechanics Conference*, Hamilton, ON. Canada
- 6.) Hernandez, E.M. (2013) “Tracking Dynamic Stress Response Based on Acceleration Measurements”. *ASCE Engineering Mechanics Conference*, Evanston, IL.
- 5.) Hernandez, E.M. (2011) “Optimal Model Based State Estimation in Mechanical and Structural Systems”. *ASCE Engineering Mechanics Conference*, Boston, MA.
- 4.) Hernandez, E.M. (2011) “Post Earthquake Damage Detection in Instrumented Buildings Using Identified Dissipated Energy”. *ASCE Engineering Mechanics Conference*, Boston, MA.
- 3.) Hernandez, E., Cabrera, E. and Reyes, P., (2009) “Seismic Vulnerability of Existing Buildings in Santo Domingo and Santiago”. *Proceedings of the Latin American Conference in Earthquake Engineering*, Santiago, D.R.
- 2.) Hernandez, E. and Bernal, D. (2006) “State Estimation in Structural Systems with Uncertain Stiffness and Damping Matrices”. *Proceedings of the 4th International Conference in Structural Control and Monitoring*, San Diego, CA.
- 1.) Bernal, D. and Hernandez, E. (2004) “Robust Data Driven Methodology for Damage Detection due to Earthquakes”. *4th International Workshop in Structural Health Monitoring and Control*, New York, NY.

### **Invited Presentations and Research Seminars**

- 26.) “Recent Advances in Post-Earthquake Assessment of Infrastructure Systems”. Graduate Seminar Civil, Geological and Mining Engineering Dept. Montreal Polytechnique, 2017.
- 25.) “Smart Infrastructure Systems in Natural Disasters” Civil Engineering Dept. Graduate Seminar, Instituto Tecnológico de Santo Domingo. 2017
- 24.) “Non-linear Analysis of Structures, When and How?” Pontificia Universidad Madre y Maestra, Santiago, Dominican Republic. 2017
- 23.) “On a Mechanical Interpretation of the Kalman filter”. Graduate Seminar Mechanical Engineering Dept. University of Rhode Island, 2017
- 22.) “Smart Structures”. UVM/GIV Engineering Summer Institute, Burlington, VT, 2017



- 21.) "Structural Health Monitoring, Diagnosis and Prognosis using Minimal Instrumentation". IEEE Conference in Prognostics and Health Management. Invited Tutorial Session. 2016.
- 20.) "Fatigue Monitoring, Diagnosis and Prognosis of Fracture Critical Structures". Civil Engineering Dept., Clarkson University. Potsdam, NY. 2016
- 19.) "Smart Structures: The Next Frontier in Structural Engineering". Penn Club, New York, NY. 2016
- 18.) "Mathematical Modeling of Smart Structures". St. Michael College, Mathematics Dept. Colloquium. Burlington, VT. 2016.
- 17.) "Fatigue Monitoring, Diagnosis and Prognosis of Fracture Critical Structures". Northeastern University Structural Graduate Engineering Association Annual Lecture. Boston, MA. 2015
- 16.) "Smart Engineers and Smart Structures". UVM/GIV Engineering Summer Institute, Burlington, VT. 2015
- 15.) "Structural Health Monitoring, Diagnosis and Prognosis using Minimal Instrumentation" Civil Engineering Dept., University of Pittsburgh, PA. 2015
- 14.) "Recent Advances and Challenges in Structural Health Monitoring" Simpson Gumpertz and Heger, Consulting Engineers, Waltham, MA. 2014
- 13.) "Multiscale Model-Data Fusion for Structural Health Monitoring of Fracture Critical Structures" Civil Engineering Dept., Worcester Polytechnic Institute, Worcester, MA. 2014
- 12.) "Smart Engineers and Smart Structures". UVM/GIV Engineering Summer Institute, Burlington, VT. 2013
- 11.) "Vibration Based Structural Health Monitoring of I-89 Bridge 58N" Civil Engineering Dept., University of Massachusetts Amherst, MA. 2013
- 10.) "Vibration Based Structural Health Monitoring of I-89 Bridge 58N" Joint Vermont ASCE-SEA Winter Meeting, Burlington, VT. 2013
- 9.) "Stress Estimation using Observers" Civil Engineering Dept., Northeastern University, Boston, MA. 2013
- 8.) "Smart Structures". UVM/GIV Engineering Summer Institute, Burlington, VT. 2012
- 7.) "Optimal Model Based State Estimation in Second Order Systems". Civil Engineering Dept., Clarkson University, Potsdam, NY. 2011
- 6.) "ABC's of Modern Earthquake Engineering". UVM/GIV Engineering Summer Institute, Burlington, VT. 2011
- 5.) "Rapid Visual Screening of Seismic Vulnerability of Buildings in Santo Domingo". International Conference of Seismic Engineering. Pontificia Universidad Catolica Madre y Maestra (PUCMM), Santiago, Dom. Rep. 2009
- 4.) "Seismic Resistant Design of Reinforced Concrete Structures". Instituto Tecnológico de Santo Domingo. INTEC. Santo Domingo, Dom. Rep. 2009

- 3.) “Seismic Instrumentation of Buildings – Experiences in California”. National Conference in Earthquake Engineering and Seismology. Universidad Autonoma de Santo Domingo (UASD), Santo Domingo, Dom. Rep. 2008
- 2.) “Structronics – New Frontier in Structural Engineering” Universidad Autonoma de Santo Domingo (UASD) Santo Domingo, Dom. Rep. 2008
- 1.) “Advanced Methodologies for Post-Earthquake Assessment of Buildings” Pontificia Universidad Catolica Madre y Maestra (PUCMM), Santiago, Dom. Rep. 2005

## TEACHING

### 2011-current

#### **The University of Vermont. Burlington, VT**

College of Engineering and Mathematical Sciences  
Department of Civil and Environmental Engineering

#### ▪ **Structural Analysis – CE170**

- Credits: 3

- Description: The inherent strength and stiffness possessed by solids which allows stable forms to exist, is their structure. Some structures arise spontaneously in nature while others are engineered by humans. The objectives of this course are: (i) to provide the conceptual framework that enables a rational understanding of structural forms and (ii) present the analytical and computational methods necessary to analyze them when subjected to stresses and strains within the linear-elastic range of the constitutive material.

- Topics: equilibrium, compatibility, constitutive laws, structural types, loads on structures, cables and arches, statically determinate trusses, beams and frames, influence lines, deformations using classical methods, energy methods, Castigliano’s theorems, theorem of virtual work, introduction to statically indeterminate structures.

- Semesters Taught:

- Spring 2012 (48 students)
- Spring 2013 (31 students)
- Spring 2014 (35 students)
- Spring 2015 (51 students)
- Spring 2016 (42 students)
- Spring 2017 (37 students)

#### ▪ **Concrete Structures – CE173**

- Credits: 3

- Description: Concrete is the most common engineered construction material in the world. Its popularity stems from its high strength-to-cost ratio, versatility, ease of construction, aesthetics, and durability. The objective of this course is to provide the concepts necessary to adequately analyze and design plain, reinforced and prestressed concrete structural elements and systems. The course will emphasize the application of concepts from strength of materials, statics and structural analysis to understand the mechanics and behavior of concrete elements and systems. For design related applications the course will be based on ACI-318 – Building Code Requirements for Reinforced Concrete.

- Topics: properties of concrete and steel, design criteria, design of one-way slabs and beams, design for shear and torsion, design of spread footings, retaining walls, design of columns, prestressed concrete, anchorage and connections.

- Semesters Taught:

- Spring 2011 (34 students)

▪ **Advanced Structural Analysis – CE-271**

- Credits: 3

- Description: This course prepares students to use matrix methods to analyze linear three-dimensional statically indeterminate frame and truss structures by the flexibility and stiffness method. The course also introduces students to the following advanced topics: the finite element method for structural analysis and collapse mechanisms in frame structures.

- Topics: Review of matrix algebra, theorem of virtual work and its applications to determine forces and displacements, flexibility method, stiffness method, modeling structural systems, introduction to the finite element method, structural analysis of complex systems using computers, collapse mechanisms of frame structures.

- Semesters Taught:

- Fall 2012 (27 students)
- Fall 2014 (26 students)
- Fall 2015 (19 students)
- Fall 2016 (17 students)

▪ **Safety and Reliability of Engineering Systems – CE-370**

- Credits: 3

- Description: Safe and reliable performance of engineering systems under a variety of uncertain and extreme working conditions is of enormous importance to society, especially considering the consequences associated with such failures. Energy systems, transportation systems, infrastructure systems, computer networks, just to name a few, are examples of such systems. Many of these systems operate interdependently, cut across disciplinary boundaries and require advanced computational methods to evaluate their performance. The two main themes of the course are: 1) Uncertainty modeling, quantification and propagation using computational models, and 2) Bayesian reliability of existing systems based on performance monitoring and damage models.

- Topics: failure of engineering systems with case studies, foundations of probability theory, uncertainty modeling using random variables, functions of random variables, random vectors, conditional probability, Bayes theorem, component reliability, system reliability, first order reliability methods, stochastic simulation methods, bayesian analysis of failure data.

- Semesters Taught:

- Fall 2011 (11 students)
- Fall 2013 (11 students)
- Spring 2016 (14 students)

▪ **Earthquake Engineering and Structural Dynamics – CE-395**

- Credits: 3

- Description: During their service life, civil engineering structures are subjected to time varying loads and imposed motions that induce significant dynamic effects. The objective of this course is to provide analytical and numerical methods to predict the behavior of structures subjected to time varying loads and displacement effects with emphasis on earthquake actions.

- Topics: Newton's equation of motion, linear single degree of freedom systems, linear two degree of freedom systems, multi-degree of freedom systems, modal analysis, numerical methods, principles of wave propagation, introduction to seismology, linear response of structures to ground motion, spectral analysis, nonlinear response of structures to ground motion, design principles for seismic resistant structures.

- Semesters Taught:

- Spring 2014 (6 students)

▪ **Structural Dynamics – CE-272**

- Credits: 3

- Description: During their service life structures are subjected to time varying loads and imposed motions that induce significant dynamic effects. The objective of this course is to provide analytical and numerical methods to predict the behavior of structures subjected to time varying loads and displacement effects.

- Topics: Time-domain and frequency-domain analysis of linear single degree of freedom (SDOF) systems subjected to initial conditions and(or) arbitrary loading. Multi-degree of freedom (MDOF) systems. The eigenvalue problem in structural dynamics. Analysis of linear multi-degree of freedom systems using modal analysis. Numerical methods for dynamic analysis of MDOF systems

- Semesters Taught:

- Spring 2017 (14 students)

2009-2010

**Instituto Tecnológico de Santo Domingo (INTEC). Santo Domingo, Dom. Rep.**

Department of Civil and Environmental Engineering

▪ **Reinforced Concrete Design II**

- Spring 2009 (24 students)
- Summer 2009 (31 students)

▪ **Structural Analysis I**

- Fall 2009 (16 students)
- Winter 2009 (42 students)
- Spring 2010 (29 students)

▪ **Structural Analysis II**

- Fall 2009 (25 students)
- Winter 2009 (40 students)
- Spring 2010 (31 students)

▪ **Structural Dynamics**

- Spring 2009 (19 students)

▪ **Earthquake Engineering**

- Summer 2009 (19 students)

Professional Development Seminars:

▪ **Structural Analysis and Design of High Performance Structures**

- Summer 2009 (45 participants)
- Winter 2009 (12 participants)

2003 - 2006

**Northeastern University. Boston, MA. U.S.A**  
College of Engineering  
Department of Civil and Environmental Engineering

- **Static and Strength of Materials (CIVU221)**
  - Fall 2006 (14 students)
  - Spring 2007 (17 students)
- **Structural Analysis I (CIVU320)**
  - Fall 2004 (11 students)
  - Fall 2005 (33 students)
  - Spring 2005 (41 students)
- **Reinforced Concrete Design I (CIVU324)**
  - Summer (1) 2006 (35 students)

College of Arts and Sciences  
Department of Architecture

- **Structures I (ARC-U356)**
  - Spring 2003 (14 students)
  - Spring 2004 (23 students)
  - Summer 2004 (16 students)
  - Summer 2005 (10 students)
  - Summer (2) 2006 (8 students)

2000 – 2002

**Universidad Nacional Pedro Henríquez Ureña. Santo Domingo, Dom. Rep.**  
College of Science and Technology  
Department of Civil and Environmental Engineering

- **Structural Analysis I**
  - Fall 2000 (26 students)
  - Fall 2001 (31 students)
- **Structural Analysis II**
  - Spring 2001 (21 students)

## MENTORING

### Alumni

#### Graduate Students:

- Kalil Erazo, PhD. Dissertation: “Bayesian Filtering in Nonlinear Structural Systems with Application to Structural Health Monitoring” (2015)
- Nathan Tirk, MS. Thesis: “Data Driven Uncertainty Quantification of Vehicular Live Load Effects in Bridges” (2014)
- Geoff May, MS. Thesis: “Weighted Multi-Metric Finite Element Updating: Application to Non-Composite Bridge Decks” (2013)

## **Undergraduate Students:**

- Jack Dugdale. B.S. Honors Thesis: “Timber vs. Steel Bridge Superstructure Construction: A simplified structural, economic and environmental analysis” (2015)
- Kristina Miele. B.S. Honors Thesis: “Detecting Partially Damaged Gusset Plate Connections through Vibration-based Detection Methods” (2012)
- Hannah Viele Maloy. Barret Scholar Summer Research: “Using Precariously Balanced Rocks to Assess Seismic Hazard in the Pajarito Fault System” (2015)
- Elizabeth Richards. B.S. Honors Thesis: “Damping of Cylinder Moving Through Sand” (2017)
- Andrew Lemioux. B.S. Summer Research Intern. (2014)
- Colter Peterson B.S. Summer Research Intern. . (2015)
- Nick Strella B.S. Summer Research Intern. (2015)
- Ethan Chamberlain. B.S. Summer Research Intern. (2016)
- Timothy Yandow B.S. Summer Research Intern. (2017)
- Alex Schoedler B.S. Summer Research Intern. (2017)
- Nick D’Aquila B.S. Summer Research Intern. (2017)

## **Current Students:**

### **Graduate Students:**

- Nestor Polanco, PhD candidate
- John Lens, PhD candidate
- Benjamin LeBlanc, PhD student
- Milad Roohi Gareshiran, PhD student
- Chandler Smith, PhD student

## **SERVICE**

### **University Service**

- School of Engineering Faculty Council (2015, 2012)
- ASCE Student Chapter Advisor (2011-2017)

- Civil Engineering search committee member for assistant professor (2011)
- Civil Engineering search committee member for lecturer (2011)
- Advisor to Senior Design student group (2011, 2014)
- University of Vermont Scholarship, Research and Creative Arts Committee (Spring 2013)
- CEMS Faculty Council (2013, 2016-2017)

***Thesis committee member***

Strength and durability of porous concrete, after being freezing/ thawing and salt exposure (MS)

Student: Ian Anderson (CEE)

Advisor: M. Dewoolkar

Assessment of the Simplified Procedure for Liquefaction Potential Evaluation (PhD)

Student: Lalita Oka (CEE)

Advisor: M. Dewoolkar

A Diagnostics Approach for Helicopter Drive Train Systems (MS)

Student: Praneet Menon (ME)

Advisor: D. Huston

Data Classification and uncertainty assessment: development of a new Bayesian artificial neural network (PhD)

Student: Nikos Fytilis (CEE)

Advisor: D. Rizzo

A New Evolutionary Algorithm for Mining Noisy, Epistatic, Geospatial Survey Data Associated With Chagas Disease (PhD)

Student: Nikos Fytilis (CEE)

Advisor: D. Rizzo

Navigational Complexity within Building Codes (PhD)

Student: James McLean (ME)

Advisor: D. Huston

Assessing the Probability of Fluid Migration Caused by Hydraulic Fracturing; and Investigating Flow and Transport in Porous Media Using MRI, (PhD)

Student: James Montague (CEE)

Advisor: D. Huston

***Thesis committee chair***

A Lab Environment for Object Detection And Tracking (MS)

Student: X. Ouyang (EE)

Advisor: G. Mirchandani

Fusion Systems with Standard Components of Small Rank (PhD)

Student: Matthew Welz (MATH)

Advisor: R. Foote

2D/3D Feature-Based Visual Tracking and Localization For Planetary Rover Exploration (PhD)

Student: Clark Van Dam (EE)  
Advisor: G. Mirchandani

A Drift eliminated Position and Attitude Tracking Estimation Algorithm in 3D (MS)  
Student: Ruoyu Zhi (EE)  
Advisor: G. Mirchandani

## **Professional Service**

### ***Conferences***

- Jury for student paper competition (Structural Health Monitoring committee) – joint ASCE Engineering Mechanics Conference– Probabilistic Mechanics and Reliability Conference. Vanderbilt Univ. Nashville, TN. (2016)
- International scientific committee for the Probabilistic Mechanics and Reliability Conference. Vanderbilt Univ. Nashville, TN. (2016)
- Session organizer in the ASCE Engineering Mechanics – Probabilistic Mechanics and Reliability Conference. Vanderbilt Univ. Nashville, TN. (2016). Session: Probabilistic Monitoring, Diagnosis and Prognosis of Fatigue Damage
- Session moderator in the ASCE Engineering Mechanics Conference– Probabilistic Mechanics and Reliability Conference. Vanderbilt Univ. Nashville, TN. (2016). Session: Vibration-Based Structural Health Monitoring and Damage Detection.
- Session chairing at the American Control Conference –Boston, MA (2016). Session: Flexible Structures.
- Jury for student paper competition (Structural Dynamics committee) – ASCE engineering Mechanics Conference, Stanford, CA. (2015)
- Session moderator (Vibration-based damage detection session) – ASCE engineering Mechanics Conference, Hamilton, ON. (2014)
- Local organizing committee member - ASCE Engineering Mechanics Conference, Boston, MA. (2011)
- Local organizing committee member - Latin American Conference in Earthquake Engineering, Santiago, Dom. Rep. (2009)

### ***Proposal Review***

- Proposal reviewer for Natural Sciences and Engineering Research Council of Canada (2015-2016)
- Proposal reviewer for Swiss Federal Institute of Technology-Zurich (2015-2016)
- Proposal reviewer for the Chilean Research Council (2015)
- Proposal reviewer for US National Science Foundation Panel reviewer (2012)



### ***Professional Associations***

- Advisory committee member for New England Transportation Research Council (2015-2016)
- Board of directors Vermont ASCE Chapter (2012-present)
- Organizing committee member - EERI New England Chapter (2013)

### ***Code Drafting***

- Scientific and code drafting committee member - "Minimum Requirement for Seismic Analysis and Design of Buildings and Other Structures. Ministry of Public Works. Dominican Republic (2010).
- External reviewer - ACI 369R "Guide for Seismic Rehabilitation of Existing Concrete Frame Buildings" (2010).

### ***Journal Reviewer***

- ACI Journal of Structural Engineering (2)
- Journal of Structural Control and Health Monitoring (6)
- Mechanical Systems and Signal Processing (15)
- ASTM Geotechnical Testing Journal (1)
- ASCE Journal of Engineering Mechanics (4)
- ASCE Journal of Computing in Civil Engineering (1)
- ASCE Journal of Bridge Engineering (2)
- ASCE Journal of Structural Engineering (2)
- Journal of Earthquake Engineering and Structural Dynamics (3)
- Journal of Vibration and Control (3)
- Korean Journal of Civil Engineering (2)
- Inverse Problems (1)
- Journal of Inverse Problems in Science and Engineering (2)
- Journal of Probabilistic Mechanics (1)

### **Professional Affiliations and Memberships**

- American Society of Civil Engineers (ASCE)
  - Structural Engineering Institute (ASCE-SEI)
  - Engineering Mechanics Institute (ASCE-EMI) – Member of the Dynamics Committee.
  - Engineering Mechanics Institute (ASCE-EMI) – Secretary of the Structural Health Monitoring and Control Committee.
- Society of Industrial and Applied Mathematics (SIAM)
- Earthquake Engineering Research Institute (EERI)
- Seismological Society of America (SSA)

## **CONSULTING EXPERIENCE**

**Client: Instituto Tecnológico de Santo Domingo**

Structural Vibration Monitoring

*Project:* Vibration Monitoring of Juan Bosch Bridge (cable-stayed bridge). Dom. Rep. (2015)

**Client: LEXCO**

Structural Design Peer-Review

*Project:* L. Aybar Hospital, Santo Domingo, Dom. Rep. (2014)

**Client: SUBURBIA**

Structural Design Peer-Review

*Project:* Meridian Residential Tower, Santo Domingo, Dom. Rep. (2014)

**Client: LEXCO**

Structural Design Peer-Review

*Project:* AILA International Airport, Santo Domingo, Dom. Rep. (2013)

**Client: LEXCO**

Structural Design Peer-Review

*Project:* CEDIMAT Cardiovascular Hospital, Santo Domingo, Dom. Rep. (2012)

**Client: LEXCO**

Performance Based Seismic Design

*Project:* AGORA Mall, Santo Domingo, Dom. Rep. (2010-2011)

**Client: LEXCO**

Foundation Design

*Project:* International Baptist Church, Santo Domingo, Dom. Rep. (2011)

**Client: Cabrera Consulting Engineers**

Seismic Failure Risk Assessment and Retrofit Design

*Project:* Cabral y Baez Hospital, Santiago, Dom. Rep. (2010)