

## FRANCISCO CASTRO

Senior Instructor, University of Colorado Boulder  
University of Colorado Boulder and Colorado Mesa University  
Mechanical Engineering Partnership Program  
Confluence Hall, 1410 Seventh Street, Grand Junction, CO 81501  
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### EDUCATION

<b>University of Colorado Boulder</b>	<b>Boulder, CO</b>
<i>Ph.D. in Mechanical Engineering</i>	12/2009
Thermo-Mechanical Behavior of Shape Memory Polymers	
Advisor: Jerry H. Qi	
<b>University of Colorado Denver</b>	<b>Denver, CO</b>
<i>M.Sc. in Mechanical Engineering</i>	8/2003
Measurement of Upper Extremity Performance as a Function of the Seating System	
Advisor: Ronald R. Rorrer	
<b>Pontifical Catholic University of Peru</b>	<b>Lima, Peru</b>
<i>B. Sc. in Mechanical Engineering</i>	6/1997

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### PROFESSIONAL EXPERIENCE

<b>University of Colorado-Boulder</b>	<b>Boulder, CO</b>
<b>Graduate Research Assistant</b> , Department of Mechanical Engineering	2005 - 2009
Experimental and theoretical research work on thermo-mechanical behavior of Shape Memory Polymers.	
Collaborative Research Work with Cornerstone Research Group, Dayton, OH.	
<b>University of Colorado-Denver</b>	<b>Denver, CO</b>
<b>Graduate Research Assistant</b> , Department of Mechanical Engineering	2000 - 2003
Evaluation of upper extremity performance on subjects with Multiple Sclerosis	
<b>Pontifical Catholic University of Peru</b>	<b>Lima, Peru</b>
<b>Field Engineer</b> , Department of Mechanical Engineering	1998 - 2000
Evaluation of industrial thermal equipment	
<b>Americana de Aviacion</b>	<b>Lima, Peru</b>
<b>Assistant Engineer</b> , Department of Engineering	1997
Planning, performance and control of aircraft maintenance tasks	
<b>E. Wong Supermarkets</b>	<b>Lima, Peru</b>
<b>Engineering Intern</b> , Department of Engineering	1996
Maintenance and modification of refrigeration equipment	

## ACADEMIC EXPERIENCE

### **University of Colorado Boulder**

**Grand Junction, CO**

Colorado Mesa University and University of Colorado-Boulder  
Mechanical Engineering Partnership

**Senior Instructor**, Mechanical Engineering Partnership Program

Fall 2017 - Present

**Instructor**, Mechanical Engineering Partnership Program

Fall 2010 – Spring 2017

Courses Taught:

- Computational Methods (MCEN3030)
- Circuits and Electronics (MCEN3017)
- Dynamics (MCEN3043/ENGR343)
- Component Design (MCEN3025/ENGR325)
- Data Analysis and Design of Experiments (MCEN3037)
- System Dynamics (MCEN4043)
- Mechanical Engineering Design Project I and II (MCEN4045 & MCEN4085)
  - These course involves collaborating with local industry representatives.
- Introduction to Finite Element Analysis (MCEN4173)
- Vibrations (MCEN4228)
- Advanced Materials: Polymers (MCEN4228)

Other Activities:

- Participation in ABET Accreditation: assignment collection and rubric preparation
- Management of Partnership Program website
- Organization of Recruitment Activities: presentations and campus tours
- Student Academic Advising of 40+ Mechanical Engineering undergraduate students
- Faculty Hiring Committee Member

### **University of Colorado Boulder**

**Boulder, CO**

**Instructor**, Department of Mechanical Engineering

Spring 2010

Courses taught: Dynamics and Senior Mechanical Engineering Laboratory

### **University of Colorado Boulder**

**Boulder, CO**

**Teaching Assistant**, Department of Mechanical Engineering

Fall 2005- Fall 2008

Courses: Measurements Laboratory, Solid Mechanics, and Finite Element Analysis

### **University of Colorado Boulder**

**Boulder, CO**

**Tutor**, College of Engineering and Applied Science. Computational Methods

Spring 2005

### **Pontifical Catholic University of Peru**

**Lima, Peru**

**Laboratory Assistant**, Department of Mechanical Engineering

Fall 2004

Experiment implementation and equipment maintenance in thermal sciences laboratory

### **University of Colorado Denver**

**Denver, CO**

**Teaching Assistant**, Department of Mechanical Engineering

Fall 2000

Engineering Graphics and Computer Aided Design

### **Pontifical Catholic University of Peru**

**Lima, Peru**

**Laboratory Instructor/Grader**, Department of Mechanical Engineering

1995-2000

Supervision of students in the thermal sciences laboratory

## TEACHING INTERESTS

Mechanics of Solids, Dynamics & Component Design  
Mechanical Engineering Design Project & Mechanical Engineering Laboratory  
Computational Methods & Finite Element Analysis  
System Dynamics, Vibrations, Circuits and Electronics & Thermal Sciences

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## RESEARCH INTERESTS

Mechanical Behavior of Materials  
Thermo-Mechanical Behavior of Shape Memory Polymers (SMP)  
Mechanics of Reinforced SMP Composites  
Finite Element Analysis  
Mechanical Testing

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## PUBLICATIONS

1. K.K. Westbrook, P. H. Kao, F. Castro, Y. Ding, H.J. Qi, 2011. A 3D finite deformation constitutive model for amorphous shape memory polymers: A multi-branch modeling approach for nonequilibrium relaxation processes. *Mechanics of Materials*, 24: 853-869.
2. F. Castro, K.K. Westbrook, J. Hermiller, D.U. Ahn, Y. Ding, H.J. Qi, 2011. Time and temperature dependent recovery of epoxy-based shape memory polymers. *Journal of Engineering Materials and Technology*, v133: n 2, p 021025.
3. F. Castro, K.K. Westbrook, K.N. Long, R. Shandas, H.J. Qi, 2010. Effects of thermal rates on the thermomechanical behaviors of amorphous shape memory polymers. *Mechanics of Time-Dependent Materials*, 14: n 3, p 219-241.
4. K.K. Westbrook, F. Castro, K.N. Long, A.J. Slifka, H.J. Qi, 2010. Improved testing system for thermomechanical experiments on polymers using uniaxial compression equipment. *Polymer Testing*, 29: n 4, p 503-512.
5. T. D. Nguyen, H. J. Qi, F. Castro, K.N. Long, 2008. A thermoviscoelastic model for amorphous shape memory polymers: Incorporating structural and stress relaxation, *Journal of the Mechanics and Physics of Solids*, 56: 2792-2814.
6. H. J. Qi, T. D. Nguyen, F. Castro, C. Yakacki, R. Shandas, 2008. Finite deformation thermomechanical behavior of thermally induced shape memory polymers, *Journal of the Mechanics and Physics of Solids*, 56: 1730-1751.

## CONFERENCE PROCEEDINGS

1. F. Castro, K. Westbrook, J. Hermiller, D.U. Ahn, Y. Ding, H. J. Qi. Time dependent recovery of shape memory polymers. Conference Proceedings of the Society for Experimental Mechanics Series, v 3, p 307-312, 2011, Time Dependent Constitutive Behavior and Fracture/Failure Processes - Proceedings of the 2010 Annual Conference on Experimental and Applied Mechanics, Indianapolis, IN.
2. K. Westbrook, F. Castro, H. J. Qi. Temperature dependent recovery of shape memory polymers. International SAMPE Technical Conference, 2010 SAMPE Fall Technical Conference and Exhibition, Salt Lake City, UT.
3. F. Castro, H. J. Qi, J. Hermiller, E. Havens. Time dependent thermo-mechanical behavior of thermally induced shape memory polymers. Proceedings of SPIE - The International Society for Optical Engineering, v 7290, 2009, Industrial and Commercial Applications of Smart Structures Technologies 2009, San Diego, CA.
4. J. Hermiller, K. M. Cable, C. D. Hemmerlgarn, H. J. Qi, F. Castro. Thermal design methodology for attaching morphing components. Proceedings of SPIE - The International Society for Optical Engineering, v 7290, 2009, Industrial and Commercial Applications of Smart Structures Technologies 2009, San Diego, CA.
5. H. J. Qi, F. Castro, J. Hermiller, E. Havens. Time dependent thermo-mechanical behavior of thermally induced shape memory polymers. Source: International SAMPE Symposium and Exhibition (Proceedings), v 54, 2009, SAMPE '09 Spring Symposium Conference Proceedings, Baltimore, MD.
6. F. Castro, H. J. Qi. Investigation of thermo-mechanical behavior of shape memory polymers. Society for Experimental Mechanics - SEM Annual Conference and Exposition on Experimental and Applied Mechanics 2009, v 3, p. 1616-1620, 2009, Society for Experimental Mechanics - SEM Annual Conference and Exposition on Experimental and Applied Mechanics 2009, Albuquerque, NM.
7. H. J. Qi, F. Castro, K. N. Long. Finite Element Simulations of Thermally Induced Shape Memory Polymers Based Applications, in Proceedings of NSF CMMI Grantee Conference, Knoxville, TN.
8. H. J. Qi, F. Castro, J. Hermiller, E. Havens. On the development of constitutive models of finite deformation behavior of shape memory polymers. International SAMPE Technical Conference, 2007, 2007 SAMPE Fall Technical Conference and Exhibition - From Art to Science: Advancing Materials and Process Engineering, Cincinnati, OH.
9. H. J. Qi, M.L. Dunn, K. Long, F. Castro, R. Shandas, 2007. Thermomechanical Indentation of Shape Memory Polymers, in Behavior and Mechanics of Multifunctional and Composite Materials 2007, edited by M.J. Dapino, Proc. of SPIE v.6526, 652615, San Diego, CA.
10. F. Castro, R. A. L. Rorrer, D. J. Blake, D. D. Scott, P. M. Kennedy, T. Hearty, S. G. Fitzgerald. Measurement of Upper Extremity Performance as a function of the Seating System: A Comparison on People with Multiple Sclerosis, in 26<sup>th</sup> RESNA Annual Conference Proceedings, June 2003, Atlanta, GA.

## CONFERENCE PRESENTATIONS

1. F. Castro, H. J. Qi, C. R. Shandas, 2008, Thermo-Mechanical Behavior of Thermally Induced Shape Memory Polymers, Society of Engineering Science, Urbana-Champaign, IL, October 20<sup>th</sup>, 2008.
  2. F. Castro, K. N. Long, H. J. Qi, M.L. Dunn, R. Shandas, 2008, Thermo-Mechanical Modeling of Thermally Induced Shape Memory Polymers, CU-Industry Advisory Council Meeting, Boulder, CO, May, 2<sup>nd</sup>, 2008.
  3. F. Castro, H. J. Qi, C. Yakacki, R. Shandas, 2007, Temperature Rate Effects on Thermally Induced Shape Memory Polymers, Society of Engineering Science, College Station, TX, October 22<sup>nd</sup>, 2007.
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## AWARDS AND MEMBERSHIPS

- American Society of Mechanical Engineers (ASME)
  - American Society for Engineering Association (ASEE)
  - American Society for Testing and Materials (ASTM)
  - Unconventional Energy Center at Colorado Mesa University Seed Grant: “Design and Fabrication of a Small-Scale Oilseed Processing System to Produce Feedstock for Diesel Biofuels”, December 2014, \$24,000. Proposal was directed by Dr. P. Cabot and Dr. G. Litus (CO Colorado State University, Western Colorado Research Center, Grand Junction)
  - CU-CMU Seed Grant, “Advanced Sensing of Air Pollution to Reduce Impacts of Oil and Gas Development”, March 2014, \$10,000. Proposal was directed by CU faculty: Jana Milford, Francisco Castro and Michael Hannigan.
  - CU-Boulder Mechanical Engineering Outstanding Ph.D. Dissertation (Spring 2009)
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## SKILLS

### Computational

MATLAB, Abaqus, SolidWorks, LabVIEW, AutoCad, Pro-Mechanica, Fortran, and SPSS

### Languages

Fluent in English and Spanish