Daniel Joseph Keene

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EDUCATION

Doctor of Philosophy, Mechanical Engineering — August 2013
University of Minnesota-Twin Cities — Minneapolis, MN
Thesis: "Numerical Modeling of Transport Phenomena in Reactive Porous Structures for Solar Fuel Applications"

Master of Science, Mechanical Engineering — January 2010
University of Minnesota-Twin Cities — Minneapolis, MN
Thesis: "Thermal Convection in a Porous Medium at High Rayleigh Numbers"

Bachelor of Science, Mechanical Engineering — June 2005
California Polytechnic State University-San Luis Obispo — San Luis Obispo, CA

TEACHING EXPERIENCE

Assistant Professor, Engineering Department — September 2013-Present
Seattle Pacific University — Seattle, WA

Courses Taught

- Thermodynamics (Thermo-Fluids I)
- Fluid Mechanics (Thermo-Fluids II)
- Heat Transfer (Thermo-Fluids III)
- Engineering Design
- Properties of Materials
- Statics
- Dynamics
- System Dynamics
- CAD Applications for Engineers
- Engineering Matters: An Introduction to Engineering
- Engineering Study Preparation

Teaching Assistant, Mechanical Engineering Department — January 2006-January 2013
University of Minnesota-Twin Cities — Minneapolis, MN

Lecture Courses

- Thermodynamics, 2 Semesters
- Fluid Mechanics, 3 Semesters
- Heat Transfer, 2 Semesters
- Introduction to Thermal Science, 1 Semester
- Gas Turbines, 1 Semester

Lecture Course Responsibilities

- Delivered primary lectures on behalf of professor as needed
- Prepared and delivered weekly discussion-based supplemental lectures (recitations)
- Held weekly office hours to assist students with individual questions
- Prepared and graded course assignments, quizzes, and exams

Laboratory Courses

- Thermal Energy Engineering Laboratory, 1 Semester

Laboratory Course Responsibilities

- Rehabilitated undergraduate laboratory experiments
- Brought laboratory facilities up to current safety standards
- Reconfigured laboratory equipment for improved operation and serviceability

Mechanical Engineering Tutor February 2004-May 2005
Make The Grade LLC San Luis Obispo, CA

- Tutored students individually to identify and address their areas of difficulty
- Focused on understanding and applying engineering concepts to solve problems
- Subjects included statics, dynamics, thermodynamics, and fluid mechanics

Mechanical Engineering Department Tutor January 2003-December 2004
California Polytechnic State University-San Luis Obispo San Luis Obispo, CA

- Tutored students of all engineering majors both individually and in small groups
- Received positive student feedback from students that led to an expansion of the tutoring program from statics and dynamics to also include thermodynamics

RESEARCH EXPERIENCE

Research Assistant, Solar Energy Laboratory January 2010-August 2013
Mechanical Engineering Department, University of Minnesota-Twin Cities Minneapolis, MN

- Formulated a multi-scale mathematical model to study the coupling between the chemical and transport processes in a reactive porous structure
- Developed a computational code in Fortran that efficiently addresses the strong coupling and disparate time scales of the governing conservation equations
- Performed parametric studies to determine how the morphological features of the reactive porous structure impact the solar thermochemical fuel production process
- Performed parametric studies to determine an appropriate set of operational parameters for the process and quantify off-design performance

Research Assistant, Heat Transfer Laboratory September 2005-January 2010
Mechanical Engineering Department, University of Minnesota-Twin Cities Minneapolis, MN

- Performed experiments using compressed gases to investigate thermal convection in porous media at Rayleigh numbers significantly higher than any prior studies
- Designed a test cell heater module to provide a uniform heat flux by distributing current through a thin foil and using embedded thermocouples to independently control guard heaters
- Maintained and debugged an experimental apparatus involving an instrumented convection test cell placed inside a pressure vessel that interfaces with custom data acquisition and control equipment, a water cooling circuit, a gas supply circuit, and peripheral pumps, all of which are located outside the vessel
- Reformulated global heat transport data using new sets of dimensionless groups to collapse data sets for radically different porous media and elucidated the physical mechanism responsible for this outcome

INDUSTRY EXPERIENCE

HVAC Engineering Consultant January 2005-July 2005
Patio Pacific, Inc. San Luis Obispo, CA

- Performed a quantitative product comparison study of three pet doors
- Identified performance metrics pertinent to the areas of customer interest
- Calculated the energy loss for each pet door under nominal calm wind conditions
- Designed and constructed an apparatus to measure infiltration for each product
- Experimentally quantified the infiltration from wind loadings at multiple temperatures
- Identified opportunities for reducing infiltration using flow visualization

Mechanical Engineering Intern June 2003-September 2003
Space and Airborne Systems Division, Raytheon El Segundo, CA

- Supported the mechanical design team for the B2 Radar Modernization Program
- Assisted engineers with experimental testing of vibration-induced signal distortion to inform the design of cable routing configurations
- Organized compliance of assembly components with top-level technical specifications
- Assisted managers with allocating project responsibilities between engineers

AWARDS AND HONORS

Student Choice Award for Teaching Assistant of the Year 2006-2007
Mechanical Engineering Department Fellowship, University of Minnesota-Twin Cities
Magna Cum Laude graduate of California Polytechnic State University-San Luis Obispo
Tau Beta Pi (Engineering Honor Society)
Pi Tau Sigma (Mechanical Engineering Honor Society)

SCHOLARSHIP

Journal Publications

- Keene, D., and Goldstein, R. J., "Thermal Convection in Porous Media at High Rayleigh Numbers," ASME Journal of Heat Transfer, Volume 137, n 3, 2015.
- Keene, D., Lipinski, W., and Davidson, J., "The Effects of Morphology on the Thermal Reduction of Nonstoichiometric Ceria," Chemical Engineering Science, Volume 111, pp. 231-243, 2014.
- Keene, D., Davidson, J., and Lipinski, W., "A Model of Transient Heat and Mass Transfer in a Heterogeneous Medium of Ceria Undergoing Nonstoichiometric Reduction," ASME Journal of Heat Transfer, Volume 135, n 5, 2013.
- Lipinski, W., Keene, D., Haussener, S., Petrasch, J., "Continuum Radiative Heat Transfer Modeling in Media Consisting of Optically Distinct Components in the Limit of Geometrical Optics," Journal of Quantitative Spectroscopy and Radiative Transfer, Volume 111, n 16, pp 2474-2480, November 2010.

Conference Publications

- Keene, D., Davidson, J., and Lipinski, W., "A Model of Transient Heat and Mass Transfer in a Heterogeneous Medium of Cerium Dioxide Undergoing Nonstoichiometric Reduction," Proceedings of the ASME 6th International Conference on Energy Sustainability, San Diego, CA, 2012.

Conference Abstracts

- Keene, D., Davidson, J., and Lipinski, W., "The Effects of Morphology on the Thermal Reduction of Nonstoichiometric Ceria under Direct Irradiation," American Institute of Chemical Engineers Annual Meeting, Pittsburgh, PA, 2012.

Presentations

- Presented "Numerical Modeling of Transport Phenomena in Reactive Porous Structures for Solar Fuel Applications" at University of Minnesota Doctoral Thesis Defense, Minneapolis, MN, August 13, 2013.
- Presented "A Model of Transient Heat and Mass Transfer in a Heterogeneous Medium of Cerium Dioxide Undergoing Nonstoichiometric Reduction" at the ASME 2012 6th International Conference on Energy Sustainability, San Diego, CA, July 25, 2012.
- Presented "A Numerical Study of Transport Phenomena in Reactive Porous Structures for Solar Fuel Applications" at University of Minnesota Thesis Proposal Defense, Minneapolis, MN, August 17, 2011.
- Presented "Thermal Convection in a Porous Medium at High Rayleigh Numbers" at University of Minnesota Master Thesis Defense, Minneapolis, MN, January 18, 2010.

Posters

- "Characterizing Reactive Media for Solar Thermochemical Fuel Production," E3 2011: Energy, Economic, and Environmental Conference, Minneapolis, MN, November 7, 2011.
- "Partial Redox Cycles for Solar Fuels: Radiative Transfer and Properties," E3 2010: Energy, Economic, and Environmental Conference, St. Paul, MN, November 30, 2010.
- "Solar Fuels at UMN: Radiative Transfer & Properties," Mechanical Engineering Departmental Poster Show, Minneapolis, MN, March 26, 2010.