

Erik C. Knudsen
Curriculum vitae

University of Colorado (Boulder)
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PERSONAL

Born February 18th, 1979, West Chester PA, United States Citizen
DOD SECRET Clearance

EDUCATION

Ph.D., Mechanical Engineering, University of Florida, Gainesville, FL, 2006

M.S., Mechanical Engineering, University of Florida, Gainesville, FL, 2003

B.S., Mechanical Engineering, Villanova University, Villanova, PA, 2001

RESEARCH EXPERIENCE

Naval Research Laboratory (Contractor): Center for Corrosion Science and Engineering,
Washington, DC, 2010 - 2016

The Center for Corrosion Science and Engineering at the Naval Research Laboratory specializes in corrosion prevention for Navy systems and platforms. The primary duties at NRL are environmental fracture testing of corrosion resistant alloys, corrosion fatigue testing, damage tolerance and failure analysis.

Environmental fracture testing entails the design and fabrication of fracture mechanics specimens and fixtures, data acquisition and reduction. The fracture surfaces were examined via scanning electron microscopes (SEM) to evaluate the presence of hydrogen and/or influence of corrosion products. While NRL has extensive experience with the established ASTM specifications for this sort of testing, these experiments tend to be rather expensive and very time consuming. Alternate approaches are being developed to substantially reduce cost and test time.

The combined action of corrosion and time-varying loading manifests itself in a process known as corrosion fatigue. Specialized experiments were developed to impart damaged on sensitized 5xxx grades of aluminum alloys to better understand the evolution of cracks within the microstructure.

Extensive numerical modeling of cracks within structures and test geometries has been done using both conventional (focused mesh with special elements that impart the singularity at the tip) and through the extended finite element method (XFEM).

Graduate Research: University of Florida, Gainesville, FL, Mechanical Engineering Department, 2001-2006
Research advisor: Dr. Nagaraj K. Arakere

The doctoral research entailed developing anisotropic stress intensity factor solutions using the finite element method. Material orientation and thermal effects were also included in the analysis.

Contact analysis using the finite element method was used to investigate subsurface stresses within a single-crystal superalloy for the M.S. research.

PROFESSIONAL EXPERIENCE

Northrop Grumman

Mechanical Engineer, Linthicum, MD 2007-2010

When the Fall (2006) adjunct position came to an end, a full-time position at Northrop Grumman (January, 2007) was accepted. Managers at Northrop Grumman encouraged enrollment in the Professional Development Program. This involves rotational assignments within the company in order to gain experience in a variety of departments prior to selecting a permanent position.

The first rotation was within the Structural Analysis Branch. Conduction heat transfer analysis using finite element software was performed to make reliability predictions for printed circuit boards. The second rotation took place at the Undersea Systems Division (Annapolis, MD). The largest unclassified project at the time was the Advanced SEAL Delivery System (ASDS). Various engineering tasks, such as the review of structural analysis calculations and bolt torque tests to obtain the “nut factor” were assigned to support this program. Following this assignment, a design engineering rotation was spent at the Troy Hill (Elkridge, MD) location. The mail sorting machines for the United States Post Office are designed and built at this facility. Hardware was designed, manufactured, and tested on prototype machines at the Sterling, VA mail sorting station. The last rotation was spent at the Electronic Systems Sector corporate headquarters (Linthicum, MD) where competitive intelligence (CI) was conducted to support the development of various technical proposals.

In July of 2008 a permanent position was offered to me at the Undersea Systems Division at Northrop Grumman. Technical guidance in the areas of plasticity, fatigue and fracture mechanics, mechanical design, stress analysis, and bolted joint design and analysis were provided. A cooperative research agreement (CRADA) was established between Northrop Grumman and the United States Naval Academy (Dr. Michelle Koul) to perform environmental fracture toughness tests on Inconel 725.

TEACHING EXPERIENCE

University of Colorado, Boulder, CO

Associate Teaching Professor - 2022 - Present

Undergraduate classes taught

- ASEN 1022 (Materials Science for Aerospace Engineers)
- ASEN 2701 (Introduction to Statics, Structures and Materials)
- ASEN 3712 (Structures)
- ASEN 4018 (Senior Projects I - Member of the PAB)
- ASEN 4028 (Senior Projects I - Member of the PAB)

George Mason University, Fairfax, VA

Associate Professor - 2016 - 2022

Undergraduate classes taught:

- ME 151 (Practicum in Engineering)
- ME 211 (Statics)
- ME 212 (Solid Mechanics)
- ME 311 (Mechanical Experimentation I)
- ME 313 (Materials Science)
- ME 443 (Mechanical Design I)
- ME 444 (Mechanical Design II)
- ME 499 (Advanced Solid Mechanics)
- ME 499 (Engineering Ethics and History)

Graduate classes taught:

- ME 714 (Fracture Mechanics)

George Mason University, Fairfax, VA

Adjunct Faculty Member, Fall 2015 - Spring 2016

Undergraduate classes taught: Materials Science

United States Naval Academy, Annapolis, MD

Adjunct Faculty Member, 2012

Undergraduate Courses taught: Materials Science

University of Florida, Gainesville, FL

Adjunct Faculty Member, 2006

Undergraduate Courses taught: Mechanics of Solids

University of Florida, Gainesville, FL

Teaching Assistant, 2001 - 2003

Undergraduate Courses: Instrumentation and Measurement Laboratory, Statics

AWARDS AND HONORS

- Mason CORE Award Letter, Spring 2019
- Letter of recognition (“Thank a Teacher”), Stearns Center for Teaching and Learning, 2017, 2019, 2020
- NASA Graduate Student Researchers Program Award, 2003
- Villanova College of Engineering Meritorious Service Award, 2001

PROFESSIONAL SOCIETIES AND COMMITTEES

ASTM Committee E08 (Fatigue and Fracture)
Member, 2014 - Present

ASM
Member 2016 - Present

ASEE
Member, 2018 - Present

ASME
Member, 2018 - Present

ACADEMIC SERVICE AND ADVISING

University of Colorado Aerospace Engineering Department Service

- Associate Chair, Undergraduate Operations (July 2023 – Present)
- Member - Aero. Department Undergraduate Curriculum Committee (Fall 2022 – Spring 2023)
- Member - Aero. Department ABET Committee (Fall 2022 – Spring 2023)

George Mason University Service

- George Mason University Honor Board, Spring 2017 - Spring 2022

George Mason Mechanical Engineering Department Service

- Search committee chair - lead department administrative assistant (Summer 2018)
- Search committee co-chair - laboratory technician (Summer 2018)
- Search committee chair - director of undergraduate projects (Fall 2018 - Spring 2019)
- Chair - ME Curriculum Committee (Fall 2018 - Fall 2020)
- Member - ME Undergraduate Committee (Fall 2020 - Spring 2022)
- Member - ME Executive Committee (Fall 2019 - Spring 2020)

- Member - VSE Online and Distance Education Committee (Fall 2020 - Spring 2022)
- Course Director (CD) - ME 313 (material science), Fall 2016 - Fall 2018
- Course Director (CD) - ME 212 (solid mechanics), Fall 2018 - Fall 2020
- Course Director (CD) - ME 211 (statics), Fall 2020 - Spring 2022
- Senior capstone project advisor, Fall 2017 - Spring 2022
 - Fall 2017 - Spring 2018 NSWCCD Fatigue Corrosion Test Apparatus
 - Fall 2018 - Spring 2019 ONR Benchtop Erosion Apparatus
 - Fall 2019 - Spring 2020 Automated Paint Application System
 - Fall 2020 - Spring 2021 Modified Wheelchair/Stroller for a Disabled Veteran
- Undergraduate student advisor, Fall 2016 - Spring 2022
 - Advise or mentor ~45 students each Fall or Spring semester

PROFESSIONAL DEVELOPMENT

ABET IDEAL training course, Dallas, TX, January 2019

DOD/CPO Basic Corrosion Course, Certificate of Completion, George Mason University, 2017

19th Annual Short Course on Corrosion: Fundamentals and Experimental Methods, Pennsylvania State University, 2015

NASGRO Short Course, Certificate of Completion, Southwest Research Institute, 2010

REFEREED RESEARCH PAPERS

Madhav Baral, Takayuki Hama, Erik Knudsen, Yannis P. Korkolis. Plastic deformation of commercially-pure titanium: experiments and modeling. *International Journal of Plasticity*, Volume 105, 2018, Pages 164-194.

Harvey Hack, Richard Link, Erik Knudsen, Brad Baker, Scott Olig. Mechanical properties of additive manufactured nickel alloy 625. *Additive Manufacturing*, Volume 14, 2017, Pages 105-115.

Jinyuan Zhai, Tuo Luo, Xiaosheng Gao, Stephen M. Graham, Madhav Baral, Yannis P. Korkolis, Erik Knudsen. Modeling the ductile damage process in commercially pure titanium. *International Journal of Solids and Structures*, Volume 91, 2016, Pages 26-45.

Nagaraj K. Arakere, Erik C. Knudsen, Doug Wells, Preston McGill, Gregory R. Swanson. Determination of mixed-mode stress intensity factors, fracture toughness, and crack turning angle for anisotropic foam material, *International Journal of Solids and Structures*, Volume 45, Issues 18–19, 2008, Pages 4936-4951.

Nagaraj K. Arakere, Erik C. Knudsen, Gregory Swanson, Greg Duke, Gilda Ham-Battista. Subsurface Stress Fields in Face-Centered-Cubic Single-Crystal Anisotropic Contacts. ASME. J. Eng. Gas Turbines Power, Volume 128, Issue 4, 2005, Pages 879-888.

CONFERENCE PROCEEDINGS

Kathir, N., and Knudsen, E.C. Capstone Design - Unexpected Challenges and Opportunities due to the Covid-19 Pandemic. Paper presented at 2021 ASEE Virtual Annual Conference.

Koul, M.G., and Knudsen, E.C. An Environmentally Assisted Cracking Evaluation of a High Toughness Ni-Based Alloy Under Cathodic Protection Conditions (2009). *Proceedings of the International Symposium on the Stress Corrosion Cracking in Structural Materials at Ambient Temperatures*, Padova.

Knudsen, E.C. and Arakere, N.K. Numerical Evaluation of Mode I SIF as a Function of Material Orientation for the BX-265 Foam Insulation Material (2006). *Proceedings of the ASME Turbo Expo*, Barcelona.

ORAL PRESENTATIONS AND INVITED LECTURES

Knudsen, E.C. (2018). *Usage of WileyPlus Software in Undergraduate Solid Mechanics Classes*. Orlando, FL.

Knudsen, E.C. (2012). *Crack Initiation in Sensitized 5xxx Aluminum*. Hyannis, MA.

Knudsen, E.C. (2011). *Introduction to Linear Elastic Fracture Mechanics*. Annapolis, MD.

Knudsen, E.C. and Koul, M.G. (2009). *Environmental Toughness Testing of Inconel 725*. Apopka, FL.

Knudsen, E.C. and Koul, M.G. (2008). *K_{IEAC} Evaluation of IN725 Using C(T) and Chevron-Notch Specimens*. Biloxi, MS.