JOHN W. SANDERS

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https://www.citadel.edu/mechanical/faculty-staff/dr-john-sanders/

EDUCATION

Ph.D. ♦ THEORETICAL & APPLIED MECHANICS
University of Illinois at Urbana-Champaign ♦ Champaign, IL ♦ August 2017

M.S. ♦ THEORETICAL & APPLIED MECHANICS
University of Illinois at Urbana-Champaign ♦ Champaign, IL ♦ August 2013

B.S. ♦ ENGINEERING PHYSICS and **MATHEMATICS**
Saint Louis University ♦ St. Louis, MO ♦ May 2011 ♦ GPA: 3.99 / 4.00 (*Summa Cum Laude*)

Sapienza University of Rome ♦ Rome, Italy
Visiting Scholar ♦ *Dept. of Structural & Geotechnical Engineering* ♦ Spring 2012

RESEARCH INTERESTS

Analytical Mechanics ♦ Applied Mathematics ♦ Applied Physics ♦ Computational Mechanics ♦ Fluid Mechanics ♦ Fracture Mechanics ♦ Navier-Stokes Equations ♦ Nonlinear Dynamics & Vibrations ♦ Solid Mechanics ♦ STEM Education Research ♦ Variational Calculus

ACADEMIC EXPERIENCE

THE CITADEL, THE MILITARY COLLEGE OF SOUTH CAROLINA ♦ Charleston, SC
Associate Professor ♦ *Mechanical Engineering* ♦ January 2023-present
- Maintain an active and diverse funded research program
- Serve as the instructor of record for 4 undergraduate or graduate-level courses per semester

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ Fullerton, CA
Associate Professor ♦ *Mechanical Engineering* ♦ August 2022-January 2023
Assistant Professor ♦ *Mechanical Engineering* ♦ August 2017-August 2022
- Maintained an active and diverse research program, supervising several graduate students
- Served as the instructor of record for 4 undergraduate or graduate-level courses per semester
- Rated as high as 4.00/4.00 (on average) based on end-of-semester student feedback
- Proposed and developed two new courses: EGME 402 (Analytical Dynamics) and EGME 430 (Introduction to Continuum Mechanics), both senior/graduate-level electives

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN ♦ *Mechanical Science & Engineering*
Graduate Research Assistant ♦ May 2013-June 2017 ♦ Lab of Petros Sofronis
- Collaborated in the development of a custom finite element code (the first of its kind) to simulate intergranular void growth under the combined effects of surface diffusion, grain-boundary diffusion, and bulk creep, enabling accurate prediction of rupture in high-temperature alloys
- Personally designed a method to calibrate the six material parameters of a combined transient and steady-state creep constitutive model to alloys 230 and 617 at 800°C and 900°C using experimental creep test data provided by colleagues
- Implemented said model in Abaqus (via UMAT) and used it to simulate the fields ahead of a stationary crack tip in the presence of transient and steady-state creep

Graduate Teaching Fellow ♦ Summer 2014, Summer 2015, Summer 2016
- Served as the Instructor of Record for an undergraduate-level Introductory Dynamics course
- Engaged students by illustrating advanced concepts (such as angular momentum) with in-class experiments, demonstrations, and activities, as well as by developing and coordinating an open-ended, semester-long, project-based learning exercise on air resistance in sports
- Supervised one teaching assistant, who helped with grading and held office hours
- Consistently received positive student feedback (rated as high as 4.2/5.0 on average based on end-of-semester student feedback)

Graduate Teaching Assistant ♦ Fall 2013, Spring 2015-Spring 2017
- Served as a teaching assistant for various undergraduate- and graduate-level courses, including Introductory Dynamics, Heat Transfer, and Solid Mechanics
- Used interpersonal and communication skills to help students understand difficult concepts through hour-long discussion sections, weekly office hours, and an online class forum
- Consistently added to university's "List of Teachers Ranked as Excellent by Their Students" based on the results of student evaluations (rated as high as 4.8/5.0 on average based on end-of-semester student feedback)

Graduate Research Assistant ♦ August 2011-May 2013 ♦ Lab of Harry Dankowicz
- Showed that a mathematical paradox in contact mechanics called "reverse chatter" is exhibited by realistic mechanical systems, and investigated its possible applications

SAINT LOUIS UNIVERSITY ♦ St. Louis, MO ♦ *Physics* | *Aerospace & Mechanical Engineering*

Undergraduate Research Assistant ♦ November 2010-May 2011 ♦ Lab of Arif Malik
- Wrote several Matlab programs to apply reliability-based design optimization to the metal sheet rolling process, supplementing existing code

Undergraduate Teaching Assistant ♦ Spring 2010, Fall 2010
- Served on a team of several TA's for an undergraduate-level Engineering Physics Laboratory
- Assisted students in applying what they had learned in lecture to real-world mechanical systems by facilitating laboratory experiments on a weekly basis
- Helped students develop better technical communication skills by providing detailed feedback on graded laboratory reports

Academic Tutor ♦ August 2008-December 2010
- Offered tutoring in over thirty engineering, physics, mathematics, and computer science courses ranging from the 100-level to the 400-level as part of a university-wide tutoring center
- Used interpersonal and communication skills to help students understand difficult concepts

INDUSTRY/INTERNSHIP EXPERIENCE

DRS TECHNOLOGIES / DRS MARLO COIL ♦ High Ridge, MO

Engineering Intern ♦ Summer 2010
- Identified the algorithms used in an undocumented (and long-dormant) Visual Basic program that did computations for refrigeration coil design using knowledge of thermodynamics
- Incorporated algorithms for three additional refrigerants, making the program up-to-date
- Enabled other engineers to update the program in the future by writing a manual (17 pages) detailing the process, and created an Excel spreadsheet to do all necessary calculations

Engineering Intern ♦ Summer 2009
- Improved quality by writing a C++ program (6,114 lines) to assess whether a given product complies with the *ASME Boiler and Pressure Vessel Code* and to print a written report
- Enabled other engineers to modify the program in the future, if necessary, by writing a detailed manual (40 pages) on the C++ programming language

Engineering Intern ♦ Summer 2008
- Increased efficiency by enabling batch processing of tedious Pro/ENGINEER Wildfire (now PTC Creo) tasks with the use of Distributed Pro/BATCH, a built-in batch processing tool
- Wrote a detailed manual (25 pages) on Distributed Pro/BATCH for future reference

MIDCOAST AVIATION ♦ Cahokia, IL
Consultant ♦ March 2010-April 2010
- Enabled engineers to simulate the mechanical response of a proprietary material by modeling, *pro bono*, its constitutive behavior in Pro/ENGINEER Mechanica (now PTC Creo)
- Conducted a finite element analysis validation test on the actual material in Saint Louis University's Structures Laboratory to check the results

MENTORSHIP

THE CITADEL, THE MILITARY COLLEGE OF SOUTH CAROLINA ♦ Charleston, SC
Undergraduate Research Adviser ♦ *Mechanical Engineering* ♦ January 2024-present
- Supervise undergraduate research for independent studies

Academic Adviser ♦ *Mechanical Engineering* ♦ Spring 2023-present
- Provide routine academic guidance for undergraduate Mechanical Engineering majors

UNIVERSITY PHYSICS COMPETITION
Faculty Sponsor ♦ 2019, 2020, 2021, 2022, 2023, 2024
- Sponsor teams of undergraduate Mechanical Engineering students to compete in the annual University Physics Competition, an international contest in which students must solve an applied physics problem within 48 hours
- Awards to date: 1 Silver Medal, 2 Bronze Medals, 9 Accomplished Competitors

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ Fullerton, CA
Graduate Research Adviser ♦ *Mechanical Engineering* ♦ May 2018-January 2022
- Supervised the Master's thesis research and Master's project work of several graduate students

Undergraduate Adviser ♦ *Mechanical Engineering* ♦ Spring 2020-January 2022
- Supervised undergraduate project work for independent studies

INTERNATIONAL INSTITUTE FOR CARBON-NEUTRAL ENERGY RESEARCH ♦ Champaign, IL
Research Mentor ♦ February 2016-March 2016
- Chosen by the Director to host an undergraduate student from Japan during a five-week exchange program between the University of Illinois at Urbana-Champaign and Kyushu University

UNDERGRADUATE RESEARCH SUPERVISED

THE CITADEL, THE MILITARY COLLEGE OF SOUTH CAROLINA ♦ Charleston, SC
- **Eric Becker** ♦ B.S. ♦ Mechanical Engineering ♦ Spring 2025
  - Project title: "A study of the improved efficiency of the dual-oscillator algorithm for computing resonant frequencies"

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ Fullerton, CA
- **Serop Kelkelian** ♦ B.S. ♦ Mechanical Engineering ♦ Spring 2023
  - Project title: "A web-based application for visualizing tensor component transformations"

GRADUATE RESEARCH SUPERVISED

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ Fullerton, CA
- **Jo Wang Dickinson** ♦ M.S. ♦ Mechanical Engineering ♦ Spring 2022
  - Project title: "Autonomous shepherding by multiple agents with intermittent communication"
  - Winner: CSUF 2021 Outstanding Scholarly and Creative Activities Award

- **Negar Jamshidi** ♦ M.S. ♦ Mechanical Engineering ♦ Spring 2020
  - Thesis title: "Simulating void growth in high-temperature alloys: Effect of primary creep"
- **Niloofar Jamshidi** ♦ M.S. ♦ Mechanical Engineering ♦ Spring 2020
  - Thesis title: "Simulating void growth in high-temperature alloys: Effects of surface diffusion, grain boundary diffusion, and bulk secondary creep"

GRANTS AND FUNDED PROJECTS

J. W. Sanders (PI), A. DeVoria (Co-PI), N. Washuta (Co-PI), G. Elamin (Co-PI), K. Skenes (Co-PI), J. C. Berlinghieri (Co-PI), P. Niksiar (Co-PI), J. Righter (Co-PI), D. Ragan (Co-PI), J. Crosmer (Co-PI), and **E. T. Becker**, "Toward more accurate and reliable weather predictions via progress on the Navier-Stokes problem," *Climatological Research Studies Grant*, The Lt. Col. James B. Near, Jr., USAF, '77, Center for Climate Studies at The Citadel, the Military College of South Carolina, December 15, 2023-May 15, 2025 ($12,000)

PEER-REVIEWED JOURNAL ARTICLES

J. W. Sanders, "A canonical theory of non-conservative dynamics" (in preparation)

C. Lyons and **J. W. Sanders**, "Block analogues of the trace, determinant, and rational canonical form for 2×2 block matrices" (in preparation)

J. W. Sanders, **E. T. Becker**, and A. C. DeVoria, "Extension of Hamiltonian mechanics to non-conservative systems via higher-order dynamics" (under review)

J. W. Sanders, A. C. DeVoria, N. J. Washuta, G. A. Elamin, K. L. Skenes, and J. C. Berlinghieri, "A canonical Hamiltonian formulation of the Navier-Stokes problem," *Journal of Fluid Mechanics*, vol. 984, pp. A27, 2024

J. W. Sanders and D. J. Inman, "Rapid computation of resonant frequencies for nonproportionally damped systems using dual oscillators," *ASME Journal of Vibration and Acoustics*, vol. 145, pp. 031008, 2023

J. W. Sanders, "A dual-oscillator approach to complex-stiffness damping based on fourth-order dynamics," *Nonlinear Dynamics*, vol. 109, pp. 285-301, 2022

J. W. Sanders, **N. Jamshidi**, **N. Jamshidi**, M. Dadfarnia, S. Subramanian, H. Sehitoglu, J. Stubbins, and P. Sofronis, "Effects of diffusion and primary creep on intergranular cavitation at high temperatures," *International Journal of Fracture*, vol. 236, pp.125-141, 2022

J. W. Sanders, M. Dadfarnia, H. Sehitoglu, J. Stubbins, and P. Sofronis, "On the stress field ahead of a stationary crack tip during the transition from primary to secondary creep," *International Journal of Solids and Structures*, vol. 193-194, pp. 455-473, 2020

J. W. Sanders, M. Dadfarnia, J. Stubbins, and P. Sofronis, "On the fracture of high temperature alloys by creep cavitation under uniaxial or biaxial stress states," *Journal of the Mechanics and Physics of Solids*, vol. 98, pp. 49-62, 2017

J. W. Sanders, "An easy way to determine the sense of rotation of phase plane trajectories," *The Pi Mu Epsilon Journal*, vol. 13, no. 8, pp. 491-494, 2013

PEER-REVIEWED CONFERENCE PAPERS

J. W. Sanders, **E. T. Becker**, and A. C. DeVoria, "Extension of Hamiltonian mechanics to non-conservative systems," in *Proceedings of the ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference,* Washington, DC, USA, August 25-29, 2024 (accepted, in press)

E. T. Becker, D. J. Inman, and **J. W. Sanders**, "On the improved efficiency of higher-order dynamics for computing resonant frequencies," in *Proceedings of the ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference,* Washington, DC, USA, August 25-29, 2024 (accepted, in press)

J. W. Sanders, **S. Kelkelian**, M. Wieser, and G. Bischof, "Visualizing tensor component transformations using virtual reality and web-based applications," in *Proceedings of the ASEE 2022 Annual Conference & Exposition,* Minneapolis, MN, USA, June 26-29, 2022

J. W. Sanders, **N. Jamshidi**, **N. Jamshidi**, M. Dadfarnia, S. Subramanian, and J. Stubbins, "Simulation of intergranular void growth under the combined effects of surface diffusion, grain boundary diffusion, and bulk creep," in *Proceedings of the TMS 2021 Annual Meeting & Exhibition*, March 15-18, 2021

H. Weiss and **J. W. Sanders**, "A curriculum-spanning review video library to improve retention of prerequisite course material," in *Proceedings of the ASEE 2020 Annual Conference & Exposition,* ASEE's Virtual Conference, June 22-26, 2020 (Winner: Best Paper, Mechanical Engineering Division)

J. W. Sanders, "Could chalk hopping be caused by reverse chatter?" in *Proceedings of the ASME 2018 Dynamic Systems and Control Conference,* Atlanta, GA, USA, September 30-October 3, 2018

J. W. Sanders, "Demystifying tensors: A friendly approach for students of all disciplines," in *Proceedings of the ASEE 2018 Annual Conference & Exposition,* Salt Lake City, UT, USA, June 24-27, 2018 (Winner: Best Paper, Mathematics Division)

J. W. Sanders, G. Herman, and M. West, "Scaling-up project-based learning for a large introductory mechanics course using mobile phone data capture and peer feedback," in *Proceedings of the ASEE 2016 Annual Conference & Exposition,* New Orleans, LA, USA, June 26-29, 2016

J. W. Sanders, H. Dankowicz, and W. Lacarbonara, "Design and analysis of a microelectromechanical device capable of testing theoretical models of impact at the microscale," in *Proceedings of the ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference,* Chicago, IL, USA, August 12-15, 2012

A. Malik, **J. W. Sanders**, R. Grandhi, and M. Zipf, "Reliability-based optimal cluster mill pass scheduling," in *Proceedings of the ASME 2011 International Mechanical Engineering Congress & Exposition, Denver, CO, USA, November 11-17*, 2011

ARTICLES APPEARING ON PRE-PRINT SERVERS

J. W. Sanders, A. C. DeVoria, N. J. Washuta, G. A. Elamin, K. L. Skenes, and J. C. Berlinghieri, "A canonical Hamiltonian formulation of the Navier-Stokes problem," engrXiv preprint, 2023, https://engrxiv.org/preprint/view/3189 (also available on arXiv, arXiv:2310.07085)

J. W. Sanders, "Intrinsic variational structure of higher-derivative formulations of classical mechanics," arXiv preprint, arXiv:2301.10175, 2023

J. W. Sanders, "Fourth-order dynamics of the damped harmonic oscillator," arXiv preprint, arXiv:2109.06034, 2021

INVITED TALKS

"Extension of Hamiltonian mechanics to non-conservative systems," *ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, Washington, DC, USA, August 25-29, 2024 (upcoming)

"On the improved efficiency of higher-order dynamics for computing resonant frequencies," *ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, Washington, DC, USA, August 25-29, 2024 (upcoming)

"Modal analysis of non-proportionally damped dynamical systems without simultaneous diagonalization," Engineering Graduate Seminar, Saint Louis University, September 26, 2022

"Simulation of intergranular void growth under the combined effects of surface diffusion, grain boundary diffusion, and bulk creep," *TMS 2021 Annual Meeting & Exhibition*, March 15-18, 2021

CONTRIBUTED TALKS

"A tale of two theories: Using ideas from quantum gravity physics to predict resonant frequencies in engineering structures faster and more efficiently than ever before," Pollak Library Faculty Noontime Talk Series, California State University, Fullerton, October 11, 2022

"Visualizing tensor component transformations using virtual reality and web-based applications," *ASEE 2022 Annual Conference & Exposition,* Minneapolis, MN, USA, June 26-29, 2022

"Quantifying crack-tip stress concentrations in high-temperature superalloys using Abaqus Unified FEA with a UMAT user-defined material subroutine," SIMULIA Regional User Meeting, Santa Clara, CA, USA, June 22, 2022

"Could chalk hopping be caused by reverse chatter?" *ASME 2018 Dynamic Systems and Control Conference,* Atlanta, GA, USA, September 30-October 3, 2018

"Demystifying tensors: A friendly approach for students of all disciplines," *ASEE 2018 Annual Conference & Exposition,* Salt Lake City, UT, USA, June 24-27, 2018

"Scaling-up project-based learning for a large introductory mechanics course using mobile phone data capture and peer feedback," *ASEE 2016 Annual Conference & Exposition,* New Orleans, LA, USA, June 26-29, 2016

"Design and analysis of a microelectromechanical device capable of testing theoretical models of impact at the microscale," *ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference,* Chicago, IL, USA, August 12-15, 2012

COURSES TAUGHT

THE CITADEL, THE MILITARY COLLEGE OF SOUTH CAROLINA ♦ *Mechanical Engineering*

- **ENGR 101 | Intro to Engineering:** Engineering students will broaden their understanding of the various engineering disciplines and sub-disciplines and develop a greater commitment to one engineering major. Various projects, conducted within a collaborative learning environment, focus on creative engineering solutions through technical analysis, critical thinking, teamwork, communication skills, and professionalism. Students will explore practical problem solving, career paths, ethical canons, professional licensure, and other topics key to academic success. Required of Civil, Computer, Construction, Electrical, and Mechanical Engineering freshmen.
- ***FSEM 101 | Logic & Inference:** Detectives use forensic evidence to reconstruct a crime and identify the culprit(s). Physicians and therapists observe a patient's symptoms to formulate a diagnosis and treatment plan. Scientists perform experiments to identify the laws of nature. Mathematicians prove general theorems that apply to anything that can be quantified. Engineers and computer scientists design products to fulfill societal needs while working within given constraints. Statisticians analyze data and draw conclusions. All of these examples have one thing in common. Logic, or how we infer what is true (or not true) based on available data, is at the heart of almost every discipline. In this course, you will learn about the different types of logic used in various professions and how to apply them. Students of every major, and students who are still undecided on their major, are all equally welcome in this course. No matter what you decide to do, this course is designed to help you succeed.
- **MECH 101 | Intro to Mechanical Engineering:** The engineering design process is demonstrated through use of practical problem solving methods for mechanical projects. Course subjects include mechanical engineering career paths, ethical canons of the engineering profession, and requirements for professional licensure. Course assignments, conducted within a collaborative learning environment, focus on creative engineering solutions through technical analysis, teamwork, communication skills, and professionalism. As a foundation for sustained success in mechanical engineering, additional course topics include: lifelong learning, time management, community and professional service, and career development.
- **MECH 202 | Engineering Computer Applications:** Foundations of computing to include software tools and engineering processes for mechanical engineers. Topics may include: spreadsheet basics (Excel), structured programming (MATLAB), and programmable microcontrollers (Arduino). Introductions to teaming and creativity.
- **CIVL 304 | Mechanics of Materials:** Elastic properties of structural materials; internal stresses and strains; principal stresses and strains including Mohr's Circle; axial; torsion; flexure; shear; bolted joints; combined stresses; shear and moment diagrams; beam deflections.
- **MECH 360 | Mechanical Engineering System Design:** This course provides experience in the integration of math, science, and engineering principles leading to a comprehensive engineering design project. Open-ended, client-based design problems emphasize a multidisciplinary approach to total system design providing multiple paths to a number of feasible and acceptable solutions which meet the stated performance requirements. Design teams are required to develop product specifications, generate alternatives through modeling, make practical engineering approximations to include probabilistic approaches, perform appropriate analysis to support the technical feasibility of the design, and make decisions leading to an optimal system design.
- **MECH 365 | Computational Methods in Engineering:** An introduction to numerical methods for engineers. Applications include: fluid mechanics, gas dynamics, heat and mass transfer, thermodynamics, vibrations, automatic control systems, and kinematics. Topics include: sources of errors in computing, mathematical bases of numerical methods, and implementation of numerical techniques using MATLAB.

* Denotes courses proposed and developed by me

- **MECH 478 | Lightweight Structures:** Applies the principles of mechanics to the structural analysis of mechanical and aerospace components. Covers stress tensors, shear flow in open and closed sections, beam columns, asymmetrical bending, Castigliano's theorem, statically indeterminate structures, thin-walled pressure vessels, introduction to elasticity.
- **MECH 499 | Advanced Independent Study in Mechanical Engineering:** The student, on an individual or small group basis, pursues advanced study of a research topic in mechanical engineering. The scope of the course is tailored to the desires of the student in consultation with the faculty advisor. The student is required to define and analyze the problem, study the fundamentals involved, organize the approach, determine the procedure, achieve a solution, and submit a written report.
- **MECH 606 | Fatigue and Fracture:** Stationary crack under static loading, energy balance, crack initiation and growth, dynamic crack growth, and fatigue of metals, ceramics, polymers, and composites.
- **MECH 697 | Special Topics in Mechanical Engineering:** Special topics in mechanical engineering will be offered to graduate students occasionally when the interest of the students and the availability of an instructor dictate.
- **MECH 702 | Theory of Elasticity:** Plane stress and plane strain; two-dimensional problems in rectangular and polar coordinates; strain energy methods; complex variables in two-dimensional problems; the general equations of three-dimensional elasticity.
- **MECH 703 | Theory of Plasticity:** Stress and strain tensors; elastic stress-strain relations, criteria of yielding; plastic stress-strain relations; elastoplastic problems of spheres and cylinders; the plane elastoplastic problem; the slip-line field.

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ *Mechanical Engineering*

- **EGME 205 | Digital Computation:** Computers and their numerical applications. Programming languages, MathCAD, spreadsheet, digital computation methods in statistics and solving algebraic equations. Applications of general-purpose software for engineering analysis.
- **EGME 308 | Engineering Analysis:** Fundamentals and engineering applications of Fourier transforms, Laplace transforms, complex analysis, vector analysis; engineering applications.
- **EGME 331 | Solid Mechanics:** Mechanical properties of materials. Stress and strain. Elastic, plastic and thermal deformation, and failure criteria. Stress-strain relationships, stress-strain transformation, principal stresses, Mohr's circle. Analysis and design of beams for bending. Buckling of columns. Pressure vessels.
- ***EGME 402 | Analytical Dynamics:** Newtonian and Lagrangian mechanics; three-dimensional kinematics and kinetics of particles and rigid bodies; constrained systems; the calculus of variations; numerical methods; applications to engineering and design problems.
- **EGME 410 | Introduction to the Finite Element Method:** Basic concepts of integral and matrix formulation of boundary value problems. One dimensional finite element formulation of heat transfer, truss beam and vibration problems. Applications of commercial finite element programs. Selection criteria for code, element, and hardware. CAD system interfaces.
- ***EGME 430 | Introduction to Continuum Mechanics:** Continuum theory of solids and fluids; tensors and indicial notation; stress and strain; balance of linear and angular momentum; Hooke's law of linear elasticity; Newton's law of viscosity; applications to finite element analysis, computational fluid dynamics, and engineering design problems.

* Denotes courses proposed and developed by me

- **EGME 431 | Mechanical Vibrations:** Modeling and analysis of single and multiple degree-of-freedom systems. Response to forcing functions. Vibrations of machine elements. Design of vibration isolation systems. Balance of rotating machinery. Random excitation and response of mechanical structures.
- **EGME 438 | Analytical Methods in Engineering:** Ordinary and partial differential equations with constant and variable coefficients; orthogonal functions; conformal mapping; potential theory; engineering applications.
- **EGME 497 | Undergraduate Project:** Directed independent research or design project.
- **EGME 597 | Graduate Project:** Directed independent research or design project.
- **EGME 598 | Graduate Thesis:** Directed independent research project.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN ♦ *Mechanical Science & Engineering*

- **TAM 212 | Introductory Dynamics:** Kinematics and dynamics of the three-dimensional motion of particles; kinematics and dynamics of the plane motion of rigid bodies; methods of work/energy and impulse/momentum; moving reference frames.

SELECTED STUDENT COMMENTS

- “Dr. Sanders is hands down the best professor I have ever had. His knowledge and passion for the material has without a doubt made me not only a better student, but also a better engineer. I would take him for every class if I could.”
- “I have had Prof. Sanders for three semesters in a row and he is by far the best professor I have ever had! Whenever I would have a bad day, I always still wanted to go to his class. He is nice, an amazing teacher, and I always know I will learn something going to his class. I have never missed his class after three semesters.”
- “I think the most important thing to point out is how clear it is that he CARES. That's the key word here. There can be other professors that are very knowledgeable in their subject, but that doesn't necessarily mean that they care to do a good job of conveying that knowledge. He cares.”
- “The group project was really the highlight of the class. I felt more like an ‘engineer’ when I was doing the project than when I was doing homework or taking exams in my other classes.”
- “One of the best professors I’ve had, emphasizing that for engineers precision is key!”
- “This professor has been awesome. He has a great way of teaching that breaks down complex concepts into very straightforward, easy-to-learn parts. He cares deeply for his students and clearly wants everyone to succeed. I would take him for any future courses.”
- “The way the material is taught, there is no confusion. Everything that is explained makes sense.”
- “He was always upbeat, open-minded, and welcoming to student questions and attempts at conceptualizing. Most of all, I could tell that he really likes math, and that’s awesome.”
- “The instructor always seems to be excited about presenting new material. Makes for a better learning experience when the instructor is obviously interested and cares about what they are teaching.”
- “Dr. Sanders made this one of the most approachable engineering classes I have ever taken. Thank you for a great semester, Dr. Sanders!”
- “This instructor was extremely helpful inside and outside of class. He was always available and was always open to help me when I needed it. I learned a great deal by frequenting his office hours and he was always helpful.”
- “Thank you for believing in me. Many times I hear students say that instructors ‘want students to fail’ or ‘they want to make the class as hard as possible.’ Somehow you have found the perfect balance of challenging me and being there as support when I didn’t understand something. You always showed concern, broke it down, and never moved on until I got it. With your

encouragement and support, I often walked out of the classroom thinking, 'This is the whole reason I came back to school.'"
- "I missed the first exam of this class and instead of quitting on me and telling me to drop he pushed me the rest of the semester to make up for lost ground. Thank you, Dr. Sanders."

UNIVERSITY SERVICE

THE CITADEL, THE MILITARY COLLEGE OF SOUTH CAROLINA ♦ Charleston, SC
Faculty Senate ♦ 2023-present
- Represent the Department of Mechanical Engineering on the Faculty Senate
- Serve on the Senate's Sabbatical Committee, reviewing applications for sabbatical leave and making recommendations to the Provost

Institutional Review Board (IRB) ♦ 2023-present
- Review applications for faculty research involving human subjects to ensure compliance with relevant ethical and legal guidelines, and make recommendations to the IRB Chair

Diversity and Inclusion Committee (School of Engineering) ♦ 2023-present
- Review, formulate, and recommend policies and procedures to promote diversity, equity, and inclusion in the School of Engineering

Tenure and Promotion Committees ♦ 2023-present
- Evaluate progress toward tenure and promotion for various faculty members in the School of Engineering

Climate Center Fellow ♦ 2023-present
CEITL&DE Faculty Fellow ♦ 2023-2024

CALIFORNIA STATE UNIVERSITY, FULLERTON ♦ Fullerton, CA
Diversity and Inclusion Committee ♦ 2018-2022
- Reviewed, formulated, and recommended policies and procedures to promote diversity, equity, and inclusion at the university-level
- Spearheaded revision of the university's policy on Tenure and Promotion Personnel Standards (UPS 210.002) to improve equity

Diversity, Equity, and Inclusion Committee ♦ 2020-2022
- Reviewed, formulated, and recommended policies and procedures to promote diversity, equity, and inclusion at the college-level
- Served as the liaison between the college-level Diversity, Equity, and Inclusion Committee and the university-level Diversity and Inclusion Committee

Assessment and Continuous Improvement Committee ♦ 2018-2022
- Designed, conducted, analyzed, and evaluated assessments of the Mechanical Engineering Department using data from students, instructors, and alumni as part of the ABET accreditation process

Department Faculty Search Committee ♦ 2018-2020
- Reviewed applications and recommended candidates for open tenure-track faculty positions in the Mechanical Engineering Department

PROFESSIONAL SOCIETIES

- **Society for Experimental Mechanics (SEM)**, 2022-present
- **The Minerals, Metals, and Materials Society (TMS)**, 2021-present
- **American Society of Engineering Education (ASEE)**, 2017-present
- **American Society of Mechanical Engineers (ASME)**, 2012-present
- **Pi Mu Epsilon National Mathematics Honor Society (PME)**, 2011-present

SOFTWARE

ABAQUS ♦ ANSYS ♦ Blackboard ♦ C++ ♦ Canvas ♦ FORTRAN ♦ Gradescope ♦ HTML ♦ LaTeX ♦ Mathematica ♦ Matlab ♦ Microsoft Office Word, Excel, PowerPoint ♦ Moodle ♦ R ♦ TecPlot ♦ Zoom

LANGUAGES

English (fluent) ♦ Spanish (proficient) ♦ Latin (proficient) ♦ Italian (limited) ♦ Ancient Greek (limited)

SELECTED HONORS & AWARDS

- *Climate Center Fellow* ♦ The Lt. Col. James B. Near, Jr., USAF, ’77, Center for Climate Studies ♦ The Citadel, the Military College of South Carolina ♦ 2023-present
- *Faculty Award for Scholarly and Creative Activity* ♦ California State University, Fullerton ♦ 2021
- *Faculty Advisor of Distinction* ♦ California State University, Fullerton ♦ 2020
- *Best Paper, Mechanical Engineering Division* ♦ ASEE 2020 Annual Conference & Exposition
- *Best Paper, Mathematics Division* ♦ ASEE 2018 Annual Conference & Exposition
- *Robert Miller Teaching Excellence Award* ♦ University of Illinois ♦ 2017
- *Teachers Ranked as Excellent by Their Students* ♦ UIUC ♦ Fall 2013/2015, Spring 2015/2016/2017
- *Pi Mu Epsilon National Mathematics Honorary Society* member ♦ 2011-present
- *James Collins Award for Student Academic Excellence in Physics* ♦ Saint Louis University ♦ 2011
- *First Place in Mechanical Engineering* ♦ MESCON ♦ University of Evansville ♦ 2011
- *The University Physics Competition* ♦ Gold Medal (as a team of one) ♦ 2010