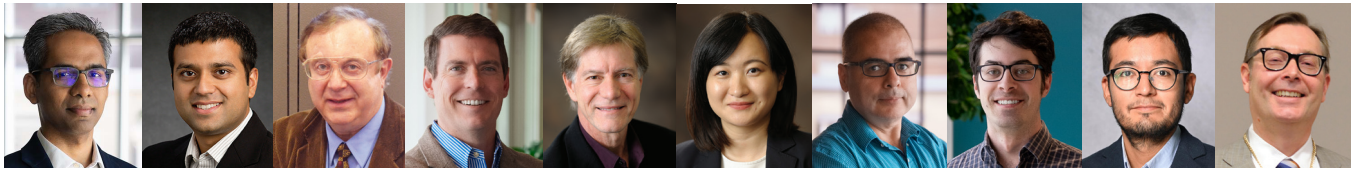


# MechSE **FACTS & FACULTY** 2024-25



Department of Mechanical Science and Engineering  
University of Illinois Urbana-Champaign



Admal      Bahl      Bentsman      Bradshaw      Brewster      Cai      Chamorro      Clemon      Constante-Amores      Dullerud



Ertekin      Ewoldt      Farjam      Feng      Ferreira      Fischer      Gazzola      Glumac      Golecki      Haghighi



Halloran      Han      He      Hilgenfeldt      Hovakimyan      Hsiao-Weckler      Hutchens      Jacobi      Jasiuk      B. Johnson



H. Johnson      Juarez      Kersh      King      Koric      Krier      Lee      Luetkemeyer      Matalon      Matlack



Mehta      Mercer      Miljkovic      Ostoj-Starzewski      Pearlstein      Ramos      Saif      Salapaka      Sehitoglu      Sinha



Smith      Sofronis      Stephani      Tang      Tawfik      Vakakis      van der Zande      Wagoner Johnson      Wandke      Wang



West      Wharry      Wise      Xu      Yim      Zhang




View this publication online  
[go.mechse.illinois.edu/FF2024](https://go.mechse.illinois.edu/FF2024)

## MECHSE DEGREE PROGRAMS

Having seven exceptional degree programs in **Mechanical Engineering**, **Engineering Mechanics**, and **Theoretical and Applied Mechanics** within the same department allows our students to tailor their curricula while providing departmental resources like the unparalleled strengths of our faculty in seven fundamental research areas and six focused societal impact areas (see the matrix, back page).

Student engagement is another hallmark of MechSE programs. The department fosters a culture that is highly supportive and collegial while offering all the benefits of a large department within a world-renowned institution. Many of our students participate in professional and registered student organizations, including nationally and internationally ranked car teams, the American Society of Mechanical Engineers (ASME), Society for Engineering Mechanics (SEM), Women in MechSE, Graduate MechSE Society (GraMS), Society of Women Engineers (SWE), National Society of Black Engineers (NSBE), Society of Hispanic Professional Engineers (SHPE), Women in Engineering (WIE), iRobotics, Engineers Without Borders, Pi Tau Sigma (PTS) mechanical engineering honor society, Tau Beta Pi engineering honor society and many others.



**#9** undergraduate program  
in ME and EM

*2024 and 2025 U.S. News and World Report*

**#6** research-based  
graduate programs

**#4** online master's  
program in ME

### Undergraduate Programs

MechSE's undergraduate programs are consistently among the top-ranked **Engineering Mechanics** and **Mechanical Engineering** programs in the world as a result of pedagogical innovation, state-of-the-art instructional laboratories, distinguished faculty, excellent undergraduate research opportunities, active student societies, a collegial and collaborative environment and exceptional students from around the world.

**Engineering mechanics** features a chosen concentration area and is for students interested in how to research, formulate, model, analyze and engineer the way things move and deform. EM students learn the basis of all mechanical sciences with an emphasis placed on the physical principles and tools needed for modern engineering design. Thanks to the strong problem-solving abilities and advanced math, science and computing skills our graduates have, they enter into careers at the forefront of a variety of fields.

**Mechanical engineering** is one of the most established and diverse of all the engineering fields and is for students who are fascinated with how machines move and work. Our program applies engineering, math and science principles to enable students to design, control and improve mechanical systems and processes.

Our undergraduate curricula offer a wide variety of courses, including an integrated hands-on design sequence beginning in the first year and culminating in a senior capstone design experience, where students develop a solution to a real-world, company-sponsored problem. MechSE students gain the critical thinking skills needed to solve even the most challenging engineering problems.


Additionally, with our pre-med track, undergraduate students have an option to follow a specialized program of courses that will help them qualify for medical school.

Our instructional and research laboratories give students hands-on experience and provide exposure to a wide array of areas, including biomechanics, control systems, dynamical systems, fluid dynamics, heat transfer, machine design, manufacturing, materials testing, mechatronics, metrology, micro-nano-mechanical systems and robotics. Our newly renovated Sidney Lu Mechanical Engineering Building provides students with state-of-the-art maker spaces and laboratories to realize their designs and perform inquiry-based research.

MechSE faculty are internationally renowned for their diverse research and excellence in teaching. Many enthusiastically engage undergraduate students in their world-class research labs.

Upon graduation, nearly 100% of our students reporting post-graduation plans were either professionally employed or pursuing graduate school. MechSE students also strongly outpace national averages on the national Fundamentals of Engineering (FE) certification exam, with a near-perfect pass rate.

As a land-grant institution, Illinois is committed to providing access to quality education for high-achieving students from all backgrounds. Illinois Commitment promises free tuition and fees for up to four years for all qualified in-state undergraduate students.



**Department of Mechanical Science and Engineering**  
The Grainger College of Engineering  
Sidney Lu Mechanical Engineering Building  
1206 W. Green Street, Urbana, IL 61801  
[mechse.illinois.edu](http://mechse.illinois.edu)



## Graduate Programs

Our students thrive throughout their advanced studies in **Mechanical Engineering** and **Theoretical and Applied Mechanics** thanks to the excellence of our faculty, the diversity and complexity of our research opportunities, and the individualized programs of study we strive to create for each of our students. MechSE graduates go on to top positions in academia, industry and government labs, and our programs have earned a reputation as some of the best in the world.

### M.Eng.ME

Our professional degree program—the **Master of Engineering in Mechanical Engineering** (M.Eng.ME)—is offered full-time, part-time, on campus and online. It launched in Fall 2015 as a course-work-based, industry-oriented way to gain advanced knowledge and experiential opportunities beyond that of a bachelor's degree. Students have the flexibility to create their own program by combining recommended courses from six existing tracks or other courses outside the tracks. Thanks to its excellent reputation in course development, student engagement and individualized student advising, program enrollment has exploded. In Fall 2024, the department welcomed its largest cohort to date, with 106 students. The online program is currently ranked #4 in the country by *U.S. News and World Report* and the program overall boasts high retention and graduation rates.

**All Grainger Engineering PhD students in good academic standing are guaranteed funding (full tuition, partial fees and a stipend) for the first five years of their program. The majority of MS students can receive tuition and fee waivers through securing an advisor who offers an RA appointment.**

### MS / PhD

Many of MechSE's graduate research opportunities lie at the intersection of diverse areas of specialization. In our MS and PhD programs, our graduate students push the boundaries of engineering, science and innovation. Alongside internationally renowned faculty, their research addresses the world's problems in energy, water, food, sustainability, health, security, manufacturing and more. Strong interdisciplinary collaborations can quickly take their work from scientific discovery to real-world solutions that address ongoing and ever-changing global concerns. MechSE's culture—both in and out of the research lab—is highly supportive and collegial while offering all the benefits of a large department within a world-renowned institution. Students realize their talents through rigorous coursework, project-based learning, real-world experiences and cutting-edge research.

## RESEARCH IN SERVICE TO SOCIETY

Mechanical engineering has traditionally dealt with objects and systems at macroscopic length scales. As system size has decreased to the nanoscale, the research efforts in the Department of Mechanical Science and Engineering have focused on phenomena at surfaces and length scales that have historically been the domain of physics and chemistry. At the same time, mechanical engineers use a systems approach to create new ideas and products that are far-reaching in order to meet societal needs. Research at MechSE, therefore, is pivotal, creating opportunities at the intersection of science and engineering.

MechSE faculty are engaged in six significant areas that impact society as a whole: Energy; Environment; Health and Bio; Manufacturing; Security and Defense; and Transportation.

Each area requires substantial collaboration, either among fundamental areas within engineering, or with other disciplines such as chemistry, physics, biology, or medicine. These collaborative efforts have the potential to shorten the timeline from scientific discovery to solutions that address ongoing and ever-changing global concerns.

Our faculty are developing unprecedented capabilities—in experiment and simulation—that will advance the field for years to come. Our approach is reflected in how we educate our students at all levels and in our next-generation curriculum in mechanical science and engineering.

## RESEARCH CENTERS

Our science-based approach brings MechSE researchers into close contact with researchers in other departments, universities and research institutions. Our faculty are leaders or major participants in research centers at the department, college and university levels.

- Air Conditioning and Refrigeration Center (ACRC)
- Center for Autonomous Vehicles in Air Transportation Engineering (AVIATE)
- Center for Autonomy
- Center for Networked Intelligent Components and Environments (C-NICE)
- Center for Hypersonics and Entry Systems Studies (CHESS)
- Center for UAS Propulsion (CUP)
- Fracture Control Program (FCP)
- Illinois Quantum and Microelectronics Park
- International Institute for Carbon-Neutral Energy Research (I<sup>2</sup>CNER)
- NSF Data and Informatics Graduate Intern-Traineeship: Materials at the Atomic Scale (DIGI-MAT)
- NSF Illinois Materials Research Science and Engineering Center (I-MRSEC)
- Center for Power Optimization of Electro-Thermal Systems (POETS)

### Campus-Level Institutes

- Beckman Institute for Advanced Science and Technology
- Coordinated Science Laboratory (CSL)
- Carl R. Woese Institute for Genomic Biology
- Materials Research Laboratory (MRL)
- National Center for Supercomputing Applications (NCSA)
- Nick Holonyak Micro and Nanotechnology Laboratory (MNTL)

## FACULTY RESEARCH AT A GLANCE

MechSE faculty have aligned their research efforts with societal needs to have the greatest impact in the world. The seven columns of the research matrix below list our fundamental areas of the discipline, while the six rows represent critical societal needs.

FUNDAMENTAL AREAS SOCIETAL IMPACT	FLUID MECHANICS	SOLID MECHANICS AND MATERIALS	THERMO AND HEAT TRANSFER	APPLIED PHYSICS	CHEMISTRY	DYNAMICS AND CONTROLS	COMPUTATION & APPLIED MATH
ENERGY	Bradshaw, Brewster, Chamorro, Constante-Amores, Ewoldt, Feng, Fischer, Gazzola, He, Jacobi, Matalon, Miljkovic, Pearlstein, Smith, Tang, Wang	Admal, Bahl, Cai, Ertekin, Gazzola, He, Jasiuk, H. Johnson, Matlack, Sehitoglu, Sofronis, Vakakis, van der Zande, Wharry	Bahl, Bradshaw, Brewster, Cai, Fischer, Glumac, Jacobi, King, Lee, Matalon, Miljkovic, Sinha, Smith, Stephani, Tang, van der Zande, Wang	Admal, Bahl, Cai, Chamorro, Constante-Amores, Ertekin, Feng, Gazzola, Jasiuk, H. Johnson, King, Matalon, Matlack, Miljkovic, Sehitoglu, Sinha, Smith, Stephani, Vakakis, van der Zande, Wharry	Bradshaw, Cai, Ertekin, He, Lee, Sinha, Smith, Stephani, van der Zande	Bahl, Bentsman, Constante-Amores, Hovakimyan, Matlack, Mehta, Salapaka, Vakakis, Wang, West	Admal, Constante-Amores, Ertekin, Ewoldt, Fischer, Gazzola, Jasiuk, Matalon, Pearlstein, Smith, Sofronis, Stephani, Vakakis, West
ENVIRONMENT	Chamorro, Constante-Amores, Feng, Fischer, Juarez, Ostoja-Starzewski, Pearlstein, Smith, Wang	Cai, Clemon, Constante-Amores, Ertekin, Farjam, Hagh, Koric, Ostoja-Starzewski, Wagoner Johnson	Bradshaw, Brewster, Cai, Chamorro, Constante-Amores, Jacobi, Koric, Lee, Sinha, Smith, Tang, Wang	Cai, Chamorro, Clemon, Constante-Amores, Farjam, Ertekin, Feng, Hagh, Juarez, Sinha, Smith	Cai, Ertekin, Feng, He, Lee, Smith	Bentsman, Constante-Amores, Farjam, Hovakimyan, West	Clemon, Constante-Amores, Ertekin, Feng, Fischer, Hagh, Juarez, Ostoja-Starzewski, Pearlstein, Smith, West
HEALTH AND BIO	Bahl, Chamorro, Constante-Amores, Ewoldt, Feng, Fischer, Gazzola, Hilgenfeldt, Juarez, Pearlstein	Constante-Amores, Ewoldt, Farjam, Gazzola, Hagh, Halloran, Han, Hilgenfeldt, Hutchens, Jasiuk, Kersh, King, Koric, Luetkemeyer, Ostoja-Starzewski, Saif, Sehitoglu, Wagoner Johnson, Wandke, Xu	Han, Hilgenfeldt, Koric, Ostoja-Starzewski, Sinha	Farjam, Feng, Gazzola, Hagh, Han, Hilgenfeldt, Hutchens, Jasiuk, Juarez, Luetkemeyer, Saif	Feng, Hutchens, Luetkemeyer, Pearlstein, Saif	Bentsman, Farjam, Halloran, Hovakimyan, Hsiao-Wecksler, Ramos, Salapaka, Xu, Yim	Ewoldt, Feng, Gazzola, Hagh, Hilgenfeldt, Jasiuk, Juarez, Kersh, Koric, Luetkemeyer, Ostoja-Starzewski, Salapaka, Wagoner Johnson, Wandke, West
MANUFACTURING	Constante-Amores, Ewoldt, Feng, Ferreira, Hilgenfeldt, King, Miljkovic, Smith	Admal, Cai, Clemon, Farjam, Han, Hilgenfeldt, Hutchens, Jasiuk, H. Johnson, King, Koric, Matlack, Mercer, Saif, Tawfick, van der Zande, Wagoner Johnson, Wharry, Xu	Bradshaw, Cai, Han, Jacobi, King, Koric, Miljkovic, Sinha, Wang	Admal, Bahl, Cai, Clemon, Farjam, Feng, Ferreira, Han, Hutchens, H. Johnson, King, Mercer, Miljkovic, Saif, Smith, Tawfick, Vakakis, van der Zande, Wharry	Cai, Feng, King, Tawfick, van der Zande	Bentsman, Farjam, Ferreira, Hovakimyan, Ramos, Salapaka, Wagoner Johnson, Xu	Admal, Clemon, Ferreira, Hilgenfeldt, Jasiuk, H. Johnson, Koric, Mercer, Smith, Vakakis, Wagoner Johnson, West
SECURITY AND DEFENSE	Brewster, Constante-Amores, Ewoldt, Gazzola, Glumac, Hilgenfeldt, Jacobi, Matalon, Matlack, Pearlstein, Stephani	Bahl, Clemon, Ewoldt, Gazzola, Jasiuk, H. Johnson, King, Matlack, Mercer, Ostoja-Starzewski, Saif, Sehitoglu, Sofronis, Tawfick, Vakakis, van der Zande, Wharry	Brewster, Ewoldt, Glumac, Jacobi, King, Matalon, Sinha, Stephani	Bahl, Clemon, Gazzola, Jasiuk, H. Johnson, King, Matalon, Matlack, Mercer, Sehitoglu, Sinha, Stephani, Vakakis, van der Zande, Wharry	Glumac, King, Stephani, van der Zande	Bahl, Bentsman, Dullerud, Hovakimyan, Matlack, Mehta, Ostoja-Starzewski, Ramos, Salapaka, Vakakis, West, Yim	Clemon, Gazzola, Hilgenfeldt, Jasiuk, H. Johnson, Matalon, Mercer, Pearlstein, Salapaka, Sofronis, Stephani, Vakakis, West
TRANSPORTATION	Chamorro, Constante-Amores, Fischer, Matalon, Matlack, Miljkovic	Cai, Ertekin, Jasiuk, Matlack, Sehitoglu, Tawfick, Vakakis	Bradshaw, Cai, Fischer, Jacobi, Matalon, Miljkovic, Smith, Tang, Wang	Cai, Ertekin, Stephani	Cai, Ertekin, Smith, Stephani	Dullerud, Golecki, Hovakimyan, Matlack, Salapaka, Vakakis, Yim	Ertekin, Golecki, Jasiuk, Smith, Stephani, West

## MECHSE FACULTY

**Nikhil Chandra Admal:** Assistant Professor / PhD, University of Minnesota, 2014. **Current research:** Solid mechanics; computational mechanics with a focus on materials defects in crystalline systems, and interaction between atomistic and continuum domains in multiscale modeling of materials. *Developed models to study grain boundary-mediated plasticity in phenomena such as recrystallization and superplasticity in metallurgy. Developed a unified framework to link atomistic and continuum models such as classical and gradient elasticity with potential applications in multiscale modeling of materials.*

**Gaurav Bahl:** George B. Grim Professor / PhD, Stanford University, 2010. **Current research:** Optical forces and optomechanics; micro-mechanical oscillators; sensors and actuators. *Demonstrated the first microfluidic device that is mechanically actuated by light, with vibrational frequencies in the GHz regime. Demonstrated that light can be used to eliminate scattering induced mechanical losses in microsystems. Received a 2019 Presidential Early Career Award for Scientists and Engineers (PECASE).*

**Joseph Bentsman:** Professor / PhD, Illinois Institute of Technology, 1984. **Current research:** Control of nonlinear and distributed parameter systems; nonlinear oscillations; network control; stability; stochastic multiscale methods. *Introduced a new class of dynamical systems with active singularities that admit control actions during the singular phases of their motion.*

**Craig Bradshaw:** Associate Professor; Executive Director, ACRC / PhD, Purdue University, 2012. **Current research:** Thermal systems, compressors, heat pumps, air-conditioning, refrigerant and lubricant properties, model-informed design optimization, model development, fundamentals of heat and fluid flow in thermal systems, waste-heat recovery, thermodynamics, heat transfer. *Developed a novel peristaltic compressor for HVAC&R and air applications.*

**M. Quinn Brewster:** Hermia G. Soo Professor; Director, M.Eng.ME Program / PhD, University of California, Berkeley, 1981. **Current research:** Atmospheric radiation; radiation effects on cloud and mist droplet evolution; phase-change radiation. *Defined parameters that characterize radiation effect on cloud and mist droplet evolution during evaporation and condensation.*

**Lili Cai:** Assistant Professor / PhD, Stanford University, 2016. **Current research:** Combustion synthesis; nanoscale materials; energy storage and conversion; smart wearables; personal thermal management; thermal radiation. *Developed rapid and scalable flame synthesis methods of nano-materials for renewable energy storage and conversion, catalysis and electronics. Developed nanophotonic textiles with tailored thermal radiation properties for localized thermal management of the human body.*

**Leonardo Chamorro:** Professor / PhD, University of Minnesota, 2010. **Current research:** Turbulence and fluid mechanics, particle dynamics, flow-structure interaction, wind and marine energy, advanced flow diagnostics, and geophysical flows focusing on turbulent boundary layer processes. *Uncovered unsteady interaction between flexible structures and turbulence across scales; developed a fast, non-iterative tracking algorithm for the Lagrangian description of turbulence.*

**Mickey Clemon:** Teaching Assistant Professor / PhD, University of California, Berkeley, 2017; P.E. California. Additive manufacturing process scaling and optimization; mechanical design; sustainable manufacturing; impulsively loaded pressure vessels. *Development of collaborative 3D robotic printing using material extrusion.*

**C. Ricardo Constante-Amores:** Assistant Professor / PhD, Imperial College London, 2021. **Current research:** Fluid mechanics related to multiphase flows, data-driven turbulence modeling from a dynamical system point of view, Koopman theory for high-dimensional systems. *Developed a modeling framework that accounts for the presence of surfactants in multiphase systems; created low-dimensional models for canonical turbulent*

*systems such as pipe flow and plane Couette flow; studied the role of kidney stones in renal pelvis using patient-specific CFD models.*

**Geir Dullerud:** W. Grafton and Lillian B. Wilkins Professor; Willett Faculty Scholar / PhD, Cambridge University, 1994. **Current research:** Control of complex systems, including multirate and asynchronous systems; hybrid systems; and distributed robotics. *Made significant contributions to distributed control.*

**Elif Ertekin:** Associate Professor; Andersen Faculty Scholar; Associate Head for Graduate Programs and Research; Director of Mechanics Programs / PhD, University of California, Berkeley, 2006. **Current research:** Computational modeling; mechanical properties at the nanoscale; energy storage and conversion; defect-property relationships; shape memory alloys. *Developed models defect-mediated phase transitions, structure/property relations and vibrational energy transport at the nanoscale. Applied computer models to design and predict new materials for novel photovoltaic, thermoelectric, and other energy conversion materials.*

**Randy Ewoldt:** Alexander Rankin Professor / PhD, Massachusetts Institute of Technology, 2009. **Current research:** Rheology; fluid mechanics; soft matter; design. *Made the first complete measurement of weakly-nonlinear oscillatory rheology, which had been theoretically anticipated for over 50 years, and combined this with new theoretical modeling to resolve a nearly 70-year debate concerning molecular processes of nonlinear mechanics of polymeric networks.*

**Nazanin Farjam:** Assistant Professor / PhD, University of Michigan, 2023. **Current research:** Process modeling and control, advanced manufacturing, printed electronics, electrohydrodynamic jet printing (EHD). Focusing on enhancing the flexibility, robustness, and efficiency of complex dynamic systems by developing modeling frameworks and intelligent control strategies to push the frontier of advanced manufacturing and optimize the behavior of systems and their components. *Developed a new paradigm in high-resolution additive and subtractive printing at the nano-to-micro scale. Developed the first high-fidelity modeling framework for a high-resolution EHD process across a range of printing conditions. Developed learning-based control strategies for complex manufacturing systems to address operational needs and optimize their performance while ensuring repeatability, robustness and automation.*

**Jie Feng:** Assistant Professor / PhD, Princeton University, 2016. **Current research:** Multiphase and interfacial dynamics oriented by bubbles and drops for energy, environment and human health; lipid vesicle dynamics and polymer self-assembly for drug delivery. Investigating bubble-bursting aerosols at a structurally compound interface and their implications for contaminant-containing aerosol emission. Studying multi-phase flow in confined spaces related to non-Newtonian fluids and particle-laden foams for enhanced oil recovery. *Developing hybrid vesicle swimmers for efficient drug delivery. Developed a versatile nanoprecipitation platform for nanoparticle-oriented bioengineering and drug delivery. Developed a modeling framework for osmotic delivery and release of vesicles under light-triggered chemical reactions.*

**Placid Ferreira:** Tungchao Julia Lu Professor / PhD, Purdue University, 1987. **Current research:** Nanomanufacturing; nanomechatronics; manufacturing automation and systems control; process planning; programmable machines. *Developed solid-state superionic stamping (S4), a process for stamping nanoscale metallic structures; high-resolution electrohydrodynamic writing for direct writing of sub-micron structures; fully functional parallel-kinematics two and three degree-of-freedom MEMS and Mesoscale nanopositioning stages.*

**Paul Fischer:** Professor; shared appointment with Siebel School of Computing and Data Science / PhD, Massachusetts Institute of Technology, 1989. **Current research:** High-order methods and scalable algorithms for computational fluid dynamics and heat transfer. *Developed the first commercial software for distributed memory parallel computers.*



**Mattia Gazzola:** Associate Professor; Charles Conrad Kritzer Faculty Scholar / PhD, ETH Zurich, 2013. **Current research:** Bioloocomotion; computational soft robotics; computational fluid dynamics; bio-inspired optimization. *Developed inverse design approach for optimal bio-locomotion strategies; discovered universal scaling laws of inertial swimming; designed first tissue-engineered cyborg ray.*

**Nick G. Glumac:** Shao Lee Soo Professor; Cannon Faculty Scholar / PhD, California Institute of Technology, 1994. **Current research:** Spectroscopy of reacting flows and energetic materials; combustion diagnostics; metal combustion. *Produced definitive evidence that the transition away from diffusion-limited combustion in aluminum combustion occurs in the particle size range of 1 to 20 microns.*

**Thomas Golecki:** Teaching Assistant Professor / PhD, University of Illinois Urbana-Champaign, 2023; P.E., S.E. Random vibrations in structural dynamics; structural and topology optimization considering moving loads. *Developed topology optimization approaches for bridge structures to minimize total response to random traffic excitation and for high-speed rail bridges accounting for passenger comfort through vehicle-bridge interaction.*

**Varda F. Hagh:** Assistant Professor / PhD, Arizona State University, 2018. **Current research:** Computational and experimental soft matter; bio-inspired design and training of meta-materials; memory formation in matter. *Developed a systematic approach to harness the power of disorder in materials by introducing and manipulating transient learning degrees of freedom during material processing. This optimization method trains the local properties of a material to achieve the desired global behavior.*

**Kellie Halloran:** Teaching Assistant Professor / PhD, University of Illinois Urbana-Champaign, 2024. Shoulder biomechanics during and after hand-cycling exercise; inverse musculoskeletal modeling; injury prevention during exercise; engineering education. *Quantified shoulder loads (moments, muscle forces) during high- and moderate-intensity prolonged handcycling exercise using subject-specific musculoskeletal models.*

**Bumsoo Han:** Professor; Phil & Ann Sharp Scholar in Cancer Research, Cancer Center at Illinois / PhD, University of Minnesota, 2001. **Current research:** Biotransport of drug delivery, biomechanics at the tumor-stroma interface, biophysics of cell migration and chemotaxis, microphysiological system of pancreatic cancer and brain, microfluidics and 3D printing of soft materials. *Established new mechanisms of poroelastic transport for tissue engineering and 3D printing of advanced hydrogels. Developed microfluidic tumor models of pancreatic cancer with molecular precisions using genetically engineered cells. Pioneered application of microfluidic tumor models for the discovery of drugs and drug delivery system.*

**Jiajun He:** Teaching Assistant Professor / PhD, Stanford University, 2016. Porous materials for clean energy applications; carbon capture; fluid phase and interfacial behaviors associated with oil and gas production. *Proposed a model to describe the phase behaviors of hydrocarbon mixtures under nanopore confinement. Developed a design methodology for porous carbons to enhance methane volumetric storage capacity.*

**Sascha Hilgenfeldt:** Professor; Willett Faculty Scholar / PhD, University of Marburg, 1997. **Current research:** Experimental and theoretical microfluidics; cell morphology and adhesion; biomechanics; structure and dynamics of tissues, foams, and other domain systems. *Elucidated fundamental properties of interfacial systems, including sonoluminescence, domain coarsening, and size-topology correlations. Developed a new, powerful method of microfluidic flow control and a structural diagnostic approach to cell and tissue mechanics.*

**Naira Hovakimyan:** W. Grafton and Lillian B. Wilkins Professor; University Scholar; Schaller Faculty Scholar / PhD, Institute of Applied Mathematics, Russian Academy of Sciences, 1992. **Current research:** Autonomous systems, environmental sciences and social engineering. *Developed a new*

*approach for design of robust adaptive control systems with guaranteed robustness/performance, pioneered a new approach to safe learning within the robust adaptive control architecture, explored safety of operation of aerial systems from the perspective of humans' perceived safety, contributed to the foundation for development of cyber-secure autopilots, explored reinforcement learning and its applications to challenges related to global warming, and contributed to social engineering with applications to health analytics.*

**Elizabeth T. Hsiao-Wecksler:** Grayce Wicall Gauthier Professor / PhD, University of California, Berkeley, 2000. **Current research:** Design and control of ball-based robots and wheelchairs and medical education task trainers; wearable sensors for anxiety detection; musculoskeletal biomechanics of locomotion. *Developed methods to better quantify gait and postural control; created ballbot wheelchair (PURE), portable powered ankle-foot-orthosis, automatic gear shifting manual wheelchair, and robotic task trainers for performing neurological exams and heart surgery.*

**Shelby Hutchens:** Associate Professor / PhD, California Institute of Technology, 2011. **Current research:** Failure in soft solids; soft solid dynamics; large, non-linear deformation mechanics; polymers and composites; microscale materials; cellular solids. *Discovered a critical length scale in the cut-driven failure of elastomeric solids. Constructed soft, osmotically-active, plant tissue-inspired liquid/solid composites.*

**Anthony M. Jacobi:** Department Head; Richard W. Kritzer Distinguished Professor / PhD, Purdue University, 1989. **Current research:** Heat transfer and fluid mechanics with end-use energy applications. *Advanced vortex-enhanced and interrupted fin designs to improve heat transfer and reduce pressure drop; developed surface microstructures for condensate management.*

**Iwona Jasiuk:** Professor; Richard W. Kritzer Faculty Scholar; Health Innovation Professor, Carle Illinois College of Medicine / PhD, Northwestern University, 1986. **Current research:** Mechanics of materials; micromechanics; bio-mechanics; composite, biological, and nano materials; interfaces; elasticity. *Characterized hierarchical structure, composition, and properties of bone and developed experimentally based multi-scale models of bone. Proposed new poroelastic model of bone adaptation based on energy dissipation. Designed, additively manufactured, and modelled novel light-weight multifunctional bioinspired architected materials.*

**Blake Johnson:** Teaching Associate Professor; Director of Undergraduate Instructional Laboratories; Siebel Center for Design Affiliate / PhD, University of Illinois Urbana-Champaign, 2012. Experimental fluid mechanics, optical diagnostics, engineering education, service learning and community engagement. *Developed a course on Teaching and Leadership that is now required of the majority of graduate teaching assistants in The Grainger College of Engineering.*

**Harley T. Johnson:** Founder Professor; Associate Dean for Research, The Grainger College of Engineering; Director, NSF Illinois Materials Research Science and Engineering Center (I-MRSEC); Director, Illinois Quantum and Microelectronics Park / PhD, Brown University, 1999. **Current research:** Nanomechanics of electronic, photonic, and quantum materials; mechanics of nanostructures; strain effects and defects in topological materials; materials for photovoltaics; defects and properties of 2D materials; plasma-material interactions; multi-scale mechanical and electronic structure modeling. *Described a new class of dislocations in layered 2D materials.*

**Gabriel Juarez:** Assistant Professor / PhD, Northwestern University, 2009. **Current research:** Physics of fluids and living systems, Multiphysics microfluidics for particle manipulation, biodegradation of crude oil by bacteria, hydromechanics of coral larvae on reefs. *Developed microfluidic devices and flow visualization techniques to quantify microscale processes in heterogeneous fluid environments such as bacterial growth on oil-water interfaces and larval settlement on surfaces.*

**Mariana Kersh:** Associate Professor; Health Innovation Professor, Carle Illinois College of Medicine / PhD, University of Wisconsin-Madison, 2010. **Current research:** Structure-function in musculoskeletal tissues during growth and aging; imaging; finite element method. *Quantified bone strain in vivo, during locomotive tasks using coupled multi-scale musculoskeletal and finite element model.*

**William P. King:** Professor; Ralph A. Andersen Endowed Chair / PhD, Stanford University, 2002. **Current research:** Computer vision and machine learning for mechanical systems, additive manufacturing, heat transfer, micro- and nanotechnology. *Developed technologies for additive manufacturing, digital design, and materials characterization that are widely used in manufacturing. Developed methods for temperature measurements used in the semiconductor and materials industries.*

**Seid Koric:** Research Professor; Technical Associate Director, NCSA / PhD, University of Illinois Urbana-Champaign, 2006. **Current research:** Large-scale multiphysics modeling; high-performance computing; materials processing; biomechanics; sparse direct solver technologies, artificial intelligence (AI). *Developed several ground-breaking numerical methods now used worldwide to optimize continuous casting and other steel-making processes and minimize their defects and CO<sub>2</sub> footprint. Leading novel interdisciplinary research at the confluence of AI and classical numerical methods in engineering and science.*

**Herman Krier:** Research Professor; Professor Emeritus / PhD, Princeton University, 1968. Reactive gas dynamics; internal ballistics of rockets and guns; combustion physics; plasma dynamics.

**Tonghun Lee:** Bei Tse Chao and May Chao Professor / PhD, Stanford University, 2006. **Current research:** Hypersonic and gas turbine propulsion; combustion; laser and optical diagnostics; oxidation of alternative and renewable fuels; alternative power generation. *Investigated novel chemical energy conversion phenomena in combustion systems using advanced laser diagnostics.*

**Callan Luetkemeyer:** Assistant Professor / PhD, University of Michigan, 2020. **Current research:** Soft tissue mechanics, structure-function relationships in soft materials, constitutive modeling, full-field mechanics methods, mechanical inference. *Demonstrated the potential of full-field, microstructure-informed constitutive modeling as a non-invasive diagnostic imaging technique.*

**Moshe Matalon:** Grainger College of Engineering Caterpillar Distinguished Professor / PhD, Cornell University, 1977. **Current research:** Combustion theory; modeling and simulation of chemically reacting flows; theoretical fluid mechanics; applied mathematics; stability and bifurcation theory; asymptotic and perturbation methods. *Developed (i) hydrodynamic theory of flame propagation in premixed combustible gases that includes the well-known flame speed-flame stretch relation and a coordinate-free expression for the flame stretch rate, (ii) comprehensive criteria for the onset of instabilities in premixed combustion, (iii) theory for premixed turbulent flames, (iv) multi-dimensional, time-dependent theory of diffusion flames that includes complete burning, partial burning and extinction, (v) first characterization of thermo-diffusive instabilities in diffusion flames (cellular and pulsating), and (vi) numerous contributions to droplet and solid particle combustion, edge flame dynamics, micro-scale combustion and combustion in porous media and flame acceleration in long narrow channels.*

**Kathryn Matlack:** Associate Professor; Richard W. Kritzer Faculty Scholar / PhD, Georgia Institute of Technology, 2014. **Current research:** Wave propagation in solids; phononic materials and mechanical metamaterials; fluid-structure interaction; nonlinear acoustics and vibrations; contact acoustic nonlinearity; additive manufacturing; ultrasonic nondestructive evaluation; and fluid-metamaterials interaction. *Developed new materials and structures for advanced vibration control; developed new in situ nonlinear ultrasonic techniques to probe dislocation-based damage in metals.*

**Prashant Mehta:** Professor / PhD, Cornell University, 2004. **Current research:** Dynamical systems; control theory; nonlinear estimation. *Invented the feedback particle filter algorithm for nonlinear estimation.*

**Brian Mercer:** Lecturer / PhD, University of California, Berkeley, 2016. Computational and theoretical solid mechanics; finite element methods; molecular dynamics methods; multiscale and multiphysics modeling; additive manufacturing.

**Enad Miljkovic:** Founder Professor; Director, ACRC / PhD, Massachusetts Institute of Technology, 2013. **Current research:** Phase change heat transfer (boiling, evaporation, condensation, melting, and freezing); thermal energy storage, electronics cooling, dynamic system modeling, anti-fouling coatings, anti-corrosion coatings, anti-bacterial coatings, fluid mechanics of droplets and bubbles; micro/nanofabrication; additive manufacturing, interfacial phenomena; renewable energy conversion. *Developed guidelines for the design, optimization and fabrication of micro/nano-structured surfaces to enhance phase change heat transfer.*

**Martin Ostoja-Starzewski:** Professor / PhD, McGill University, 1983. **Current research:** Mechanics and transport in random and fractal media; helices and chiral media; non-classical thermomechanics; stochastic wave propagation; traumatic brain injury. *Developed (i) models of impact waves in man-made and natural media, including human brains under concussion; (ii) micromechanically based scaling laws, tensor random fields, and stochastic finite elements; (iii) universal elastic anisotropy index; (iv) linking continuum mechanics to spontaneous violations of the entropy inequality; (v) mechanics of helically wound cables; and (vi) electromagnetic shielding by nanocomposites. Elected to Academia Europaea.*

**Arne Pearlstein:** Professor / PhD, University of California, Los Angeles, 1983. **Current research:** Computational studies of incompressible flow, with applications to stability; vortex shedding; contaminant removal and chemically reacting systems; experimental development of transparent, immiscible, refractive index-matched systems for use as surrogates in multiphase flow. *Discovered the first, and most of the known, multi-valued stability boundaries in fluid mechanics.*

**João Ramos:** Assistant Professor; shared appointment with Boston Dynamics / PhD, Massachusetts Institute of Technology, 2018. **Current research:** Whole-body teleoperation of humanoid robots; robot design and control for dynamic motions; human-machine interfaces; bio-inspired robotics. *Developed a bilateral feedback teleoperation strategy to synchronize the motion of a human operator and that of a humanoid robot for dynamic manipulation and agile locomotion.*

**M Taher Saif:** Edward William and Jane Marr Gutgsell Professor; NAE / PhD, Cornell University, 1993. **Current research:** Mechanics of microelectromechanical systems (MEMS); nanoscale materials behavior; neuro-mechanics; mechanics of cancer cells and tumor microenvironment; biological machines; single cell mechanics. *Discovered a new phenomenon where plastically deformed nano crystalline metals recover plastic strain under macroscopically stress-free conditions; neurons actively maintain a rest tension, which is essential for neurotransmission. Elected to the National Academy of Engineering, 2024.*

**Srinivasa Salapaka:** Professor / PhD, University of California, Santa Barbara, 2002. **Current research:** Robust control, scanning probe microscopy, precision positioning systems, combinatorial optimization, machine learning algorithms, and control of power electronics and systems. *Developing new control architectures for bottom-up power grids.*

**Huseyin Sehitoglu:** Professor; John, Alice, and Sarah Nyquist Chair / PhD, University of Illinois Urbana-Champaign, 1983. **Current research:** Thermo-mechanical behavior of materials; phase transformations and shape memory. *Developed a model for determining the crystal orientation*



alloys; developed an atomistic-continuum treatment to predict threshold stress intensity in fatigue in agreement with experiments.

**Sanjiv Sinha:** Professor; Associate Head for Undergraduate Programs / PhD, Stanford University, 2005. **Current research:** Thermoelectric energy conversion physics, materials, and devices; thermochemical and thermophysical energy storage; fundamental heat conduction physics; intracellular thermometry. *Developed and patented roll-to-roll fabricated hybrid metal-polymer heat exchangers for waste heat harvesting; developed and patented a thermometer for measuring temperatures inside living cells; developing thermal storage energy technologies for buildings and industrial process heating.*

**Kyle C. Smith:** Associate Professor / PhD, Purdue University, 2012. **Current research:** Electrochemical separations and energy storage; multiscale computational modeling; mass, charge, heat and fluid transport in heterogeneous and porous materials; thermodynamics of electrochemical materials. *Developed and predicted strategies to desalinate water in porous electrodes using battery materials. Developing ion sorption materials with molecular recognition guided by atomistic and pore-scale modeling.*

**Petros Sofronis:** James W. Bayne Professor / PhD, University of Illinois Urbana-Champaign, 1987. **Current research:** Solid mechanics; elastic-plastic fracture mechanics; materials compatibility with hydrogen; mechanics of next-generation nuclear reactor materials; finite element methods. *Rationalized and linked for the first time the effects of hydrogen at the microscale with evidence of hydrogen-induced flow localization at the macroscale.*

**Kelly Stephani:** Associate Professor; Kritzer Faculty Fellow; Visiting Fellow, Hoover Institution, Stanford University / PhD, University of Texas at Austin, 2012. **Current research:** Hypersonics; gas-surface interactions and material response; sub-component test integration and design for applications; science, technology and policy. *Established thresholds, chemical kinetics, and underlying material response for self-healing shape-stable hypersonic TPS materials. Generated new measurables from multiple IC sources to inform policy decisions on S&T.*

**Ke Tang:** Teaching Assistant Professor / PhD, Zhejiang University, 2005. Engineering education; heat transfer and fluid mechanics with end-use energy conversion applications as refrigeration, heat pumps and air conditioning; liquid-vapor two-phase flow visualization; electronics cooling; energy conversion systems; thermoacoustics.

**Sameh Tawfik:** Professor; Ralph A. Andersen Faculty Scholar / PhD, University of Michigan, 2012. **Current research:** Material design, processing and manufacturing; mechanics of materials. *Developed synthesis and self-assembly processes to manufacture multi-functional nanocomposites.*

**Alexander Vakakis:** Donald Biggar Willett Professor / PhD, California Institute of Technology, 1990. **Current research:** Nonlinear dynamics and vibrations; non-smooth dynamics; nonlinear modal analysis, reduced-order modeling and nonlinear model updating; granular acoustic metamaterials, nonreciprocal acoustics and stress wave tailoring; targeted energy transfer and vibration energy harvesting; nano- and micro-resonators; passive control of vortex-induced vibrations and aeroelastic instabilities; intentional nonlinearity in design. *Working on a new concept for intentional use of strong nonlinearity in design and nonlinear passive energy management; formulated novel nonparametric multiscale system identification methodologies.*

**Arend van der Zande:** Associate Professor; shared appointment with Department of Materials Science and Engineering / PhD, Cornell University, 2011. **Current research:** Nanomechanics, and functional devices from nanoscale materials and heterostructures; nanoelectromechanical systems (NEMS); atomically precise nanomanufacturing techniques. *Developed graphene-based NEMS. First observed atomic grain boundary*

*structure and properties in 2D molecular membranes. Developed techniques for building functional electronic and photonic devices from 2D material heterostructures.*

**Amy Wagoner Johnson:** Professor; Andersen Faculty Scholar; Head, Department of Biomedical and Translational Sciences, Carle Illinois College of Medicine / PhD, Brown University, 2002. **Current research:** Soft tissue mechanics (oviduct, cervix, uterus) for applications in women's reproductive health including fertility and preterm birth; design of functional materials for coral propagation and restoration; design, characterization, and mechanical behavior of materials for bone replacement and repair.

**Kevin Wandke:** Teaching Assistant Professor / PhD, University of Illinois Urbana-Champaign, 2024. Machine learning for solving coupled PDEs; simulation and modeling of soft robots. *Developed a method for correcting energy drift in long timescale machine learning simulations of dynamic systems.*

**Sophie Wang:** Research Associate Professor / PhD, Xi'an Jiaotong University, 2012. **Current research:** Thermodynamics, heat transfer and fluid mechanics. Fundamentals of single-phase and two-phase convection, phase change and stability with applications in energy systems. Heat transfer enhancement, coefficient of performance (COP) improvement, optimization, and control for heating and cooling systems.

**Matthew West:** Professor; William H. Severns Faculty Scholar / PhD, California Institute of Technology, 2004. **Current research:** Computational methods; multiscale time integration. *Developed the theory of variational time integration methods; obtained fully asynchronous integrators for computational mechanics.*

**Janelle Wharry:** Professor / PhD, University of Michigan, 2012. **Current research:** structure-property-functionality relationships of materials in mechanical, irradiation, electrochemical, and corrosive extreme environments. *Developed theories explaining phase transformations in steels under mechano-irradiation extremes. Enabling code-qualification of advanced manufacturing methods for nuclear structural alloys.*

**Kevin A. Wise:** Adjunct Lecturer / PhD, University of Illinois Urbana-Champaign, 1987. Frequency domain analysis, optimal and adaptive control theory. *Developed guidance, navigation, and control algorithms and computer architectures for piloted and unpiloted aircraft and advanced weapon systems at The Boeing Company.*

**Siyi Xu:** Assistant Professor / PhD, Harvard University, 2022. **Current research:** Soft robotics, wearable and implantable sensors, electrically responsive soft actuators, fluidic systems. *Developed biocompatible soft sensors and power-dense transducers, including actuators, valves and pumps, for the actuation and control of soft robots. Demonstrated the potential of compliant, lightweight and compact wearable robotic systems for daily assistive and therapeutic purposes.*

**Justin Yim:** Assistant Professor / PhD, University of California, Berkeley, 2020. **Current research:** Legged robot design, legged robot control, bio-inspired robotics, small robots. *Developed hopping robot control and estimation demonstrating agile, precise, and autonomous jumping in a small, one-legged robot.*

**L. Winston Zhang:** Adjunct Lecturer / PhD, University of Illinois Urbana-Champaign, 1996. Applied heat transfer with applications to electronics cooling and heat exchanger design. Heat pipe design and manufacturing. Numerical heat transfer.