

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Mechanical Engineering

Eric Johnsen, associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2008	California Institute of Technology, Mechanical Engineering, Pasadena, CA
M.S.	2002	California Institute of Technology, Mechanical Engineering, Pasadena, CA
B.S.	2001	University of California, Mechanical and Environmental Engineering, Santa Barbara, CA

Professional Record:

2017 – present	Associate Professor (with tenure), Department of Mechanical Engineering, University of Michigan
2010 – 2017	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2007 – 2009	Post-Doctoral Fellow, Center for Turbulence Research, Stanford University, Stanford CA

Summary of Evaluation:

Teaching: Professor Johnsen has established himself as a careful and caring teacher. He has taught at the undergraduate and graduate levels. He has developed one course: MECHENG 499 (Introduction to Machine Learning to Solve Engineering Problems). He also made major revisions of MECHENG 521 (Advanced Fluid Mechanics II), and MECHENG 523 (Computational Fluid Dynamics I). At the undergraduate level, he has taught the required course MECHENG 320 (Fluid Mechanics I) multiple times. His teaching evaluations have been solid and letters from students were universally positive. Professor Johnsen has been a productive and effective mentor. He has chaired 19 doctoral committees and co-chaired another seven. In addition, he has mentored three post-doctoral scholars, and co-mentors another. He has been active in mentoring masters and undergraduate students. He has also mentored undergraduates in research, through the SROP, RISE and SURE programs.

Research: Professor Johnsen's research is in the field of computational fluid dynamics. In particular, he focuses on high-fidelity, efficient, robust, scalable simulations on modern supercomputers as a means to further understand complex multi-scale and multi-physics flow phenomena. The issues he addresses are motivated by problems in medicine, transportation systems, and energy sciences. They include flows with shock waves, instabilities, bubbles, droplets, radiation, and ionization. He has contributed to method development for gas/liquid and fluid/solid interfaces, using high-order finite-difference and finite-volume methods, and Discontinuous-Galerkin finite-element methods. He has also worked on extension and

implementation of methods on exascale machines, including fault-recovery, on-node power optimization, and variable-precision computing. He has made key contributions to understanding the physics of cavitation, and of high-energy-density plasmas.

Professor Johnsen has published 59 articles, most of which are in top-tier journals such as the *Journal of Computational Physics* and *Journal of Fluid Mechanics*. He has attracted funding from national labs, agencies, and industry, and other universities to support his research. Professor Johnsen has a high level of visibility in his field. He is the recipient of an ONR Young Investigator award, and an NSF CAREER Award. He has given invited seminars at universities and labs in the US and abroad. His most-cited paper has 392 citations, and his publications taken together have more than 3500 citations and his h-index is 28, according to Google Scholar.

Recent and Significant Publications:

- Gaudron, R., M. T. Warnez, and E. Johnsen, "Bubble dynamics in a viscoelastic medium with nonlinear elasticity," *Journal of Fluid Mechanics* 766 (2015): 54-75.
- Norberg, Seth A., Eric Johnsen, and Mark J. Kushner, "Helium atmospheric pressure plasma jets interacting with wet cells: delivery of electric fields," *Journal of Physics D: Applied Physics* 49.18 (2016): 185201.
- Beig, S. A., B. Aboulhasanzadeh, and E. Johnsen, "Temperatures produced by inertially collapsing bubbles near rigid surfaces," *Journal of Fluid Mechanics* 852 (2018): 105-125.
- Johnson, Philip E., and Eric Johnsen, "The compact gradient recovery discontinuous Galerkin method for diffusion problems," *Journal of Computational Physics* 398 (2019): 108872.
- L. Mancia, J. Yang, J. S. Spratt, J. Sukovich, Z. Xu, T. Colonius, C. Franck, E. Johnsen, "Acoustic cavitation rheometry," *Soft Matter*. 2021; 17: 2931-2041.
- S. Pellone, C. A. Di Stefano, A. M. Rasmus, C. C. Kuranz, E. Johnsen, "Vortex-Sheet Modeling of Hydrodynamic Instabilities Produced by an Oblique Shock Interacting with a Perturbed Interface in the HED Regime," *Physics of Plasmas*. 2021; 28: 022303.

Service: Professor Johnsen has been active in roles at the department, college, university, and professional levels. He has served as a member of the Undergraduate Program Committee, as the associate chair for Undergraduate Education, and as a member of the Graduate Admissions Committee. He has also served on two faculty search committees, and the departmental seminars committee. At the college and university level, he has served on a college ad hoc committee establishing computer science requirements for non-CS students, on two faculty search committees, and as a college representative for more than a dozen faculty search committees. At the professional level, he coordinated the Midwest Mechanics Seminar Series for seven years, and has served as a member of technical committees for several societies. He has been very active as a session chair and session organizer for conferences and symposia, and as referee for conference proceedings and journals. His contributions to DEI have been primarily through his approach to inclusive teaching, his establishment of core values in his research group, and his work as the associate chair for Undergraduate Education. He has done outreach work at the UM Natural History Museum and in the Ann Arbor Public Schools.

External Reviewers:

Reviewer A: "Dr. Johnsen has an excellent reputation and visibility in both the national and international community and is a leader in his field."

Reviewer B: "...Eric's performance in the past six years is absolutely outstanding with respect to all three aspects of a faculty member's work: research, teaching, and service... His contributions continue to break new grounds in multiple directions and to have a major impact in the areas in which he is active."

Reviewer C: "He is leading a complex research enterprise, and has been a success in all the major areas of numerical algorithms, high-performance implementations, and scientific applications. His productivity, in terms of Ph.D. students, has been very high, a particular accomplishment in scientific computing, where research mentoring requires a lot of individual attention to each student. He is an effective fund raiser, and collaborates across a broad range of disciplines."

Reviewer D: "...Dr. Johnsen also continues to contribute to the development of numerical techniques. I find these recent contributions continue along the line of excellence in computational fluid dynamics, for which Dr. Johnsen has already built a solid reputation. It bodes well for the future."

Reviewer E: "...Prof. Johnsen is the quintessential computational scientist in addition to a deep and insightful fluid dynamicist."

Summary of Recommendation: Professor Johnsen is a dedicated and caring teacher and mentor, who is making key contributions in his research field. It is with the support of the College of Engineering Executive Committee that I recommend Eric Johnsen for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering College of Engineering.



Alec D. Gallimore, Ph.D.
Robert J. Vlastic Dean of Engineering
College of Engineering

May 2023