

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

Elliott J. Rouse, assistant professor of mechanical engineering, Department of Mechanical Engineering, College of Engineering, is recommended for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2012	Northwestern University, Biomedical Engineering, Evanston, IL
M.S.	2009	Northwestern University, Biomedical Engineering, Evanston, IL
B.S.	2007	The Ohio State University, Mechanical Engineering, Columbus, OH

Professional Record:

2017 – present	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2014 – 2017	Assistant Professor, Department of Biomedical Engineering and Department of Mechanical Engineering, Northwestern University, Evanston, IL
2014 – 2017	Faculty Research Scientist, Center for Bionic Medicine, Shirley Ryan AbilityLab, Chicago, IL
2012 – 2014	Post-doctoral Fellow, MIT Media Lab, Massachusetts Institute of Technology, Cambridge, MA

Summary of Evaluation:

Teaching: Professor Rouse is a dedicated, creative, and empathetic instructor and mentor whom students consider accessible and conscientious. He teaches several courses at the graduate and undergraduate levels, including ME 360 (Modeling, Analysis and Control of Dynamic Systems), and ME 461 (Automatic Control). His course evaluations are consistently high, and he has contributed significant features to ME 461 and ME 646. Professor Rouse has an extensive advising and mentoring record, indicated by his dedication to his students. He is currently advising five Ph.D. students at UM and has graduated three additional Ph.D. students total between UM and Northwestern. He has also advised seven M.S. students, and four post-doctoral students to date. His students consistently praise his approachability and commitment to teaching and mentoring.

Research: Professor Rouse's research focuses on biomechanics of the human gait and engineering of powered prostheses and exoskeletons that replace or augment human motor function. He has published over 30 full-length archival journal articles, seven of which are in top-tier and influential journals including *Nature Biomedical Engineering*, *IEEE Transactions on Biomedical Engineering*, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, and the *International Journal of Robotics Research*, among others. These publications have garnered more than 2300 citations, and he has an *h*-index of 24 according to Google Scholar.

Professor Rouse's funding is robust and is supported by a broad spectrum of sponsors including NSF, NIH, DoD, industry, and foundations.

Professor Rouse's work has advanced knowledge in the fields of prosthetic design and wearable robotics. He has developed methods and apparatus to characterize the impedance of human joints during walking and running and in doing so has debunked misconceptions previously held in the field. Professor Rouse is also credited with landmark demonstrations of reduced metabolic cost with a powered prosthesis and for algorithms used to decode user intent from electromyographic signals.

Recent and Significant Publications:

- Azocar, Alejandro F., Luke M. Mooney, Jean-François Duval, Ann M. Simon, Levi J. Hargrove, and Elliott J. Rouse, "Design and clinical implementation of an open-source bionic leg," *Nature biomedical engineering*, 4, no. 10 (2020): 941-953.
- Shepherd, Max K., and Elliott J. Rouse, "Design and validation of a torque-controllable knee exoskeleton for sit-to-stand assistance," *IEEE/ASME Transactions on Mechatronics*, 22, no. 4 (2017): 1695-1704.
- Shepherd, Max K., and Elliott J. Rouse, "The VSPA foot: A quasi-passive ankle-foot prosthesis with continuously variable stiffness," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 25, no. 12 (2017): 2375-2386.
- Wind, Alexander M., and Elliott J. Rouse, "Neuromotor regulation of ankle stiffness is comparable to regulation of joint position and torque at moderate levels," *Scientific Reports*, 10, no. 1 (2020): 1-9.
- Shepherd, Max K., Alejandro F. Azocar, Matthew J. Major, and Elliott J. Rouse, "Amputee perception of prosthetic ankle stiffness during locomotion," *Journal of NeuroEngineering and Rehabilitation*, 15, no. 1 (2018): 1-10.

Service: Professor Rouse has served on the Department of Mechanical Engineering's Graduate Admissions Committee, and Seminar Committee and the Robotics Institute's Executive Committee and Graduate Committee. He has served as the faculty advisor for the UM Robotics student-led team, Strengthening Augmenting Robotic Exoskeletons (STARX). Professor Rouse is serving his scientific community which includes his role as an associate editor for three professional organizations, including *IEEE Transactions on Biomedical Engineering*, *IEEE Robotics and Automation Letters*, and as guest editor for *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. He is a member of the EMBS Technical Committee on BioRobotics. Professor Rouse has dedicated his research to advancing technologies that improve the lives of people with disabilities. Additionally, he encourages DEI activities within his lab and has fostered openness and flexibility that has helped his students thrive.

External Reviewers:

Reviewer A: "Dr. Rouse is developing impact-driven, bio-inspired technologies that will change the lives of people with disabilities."

Reviewer B: "The quantity of Prof. Rouse's work is excellent, well above the typical standards for our field."

Reviewer C: "...the work he has done in prosthetic control has been novel and impactful. ... Dr. Rouse is definitely a leader in the field of wearable robotics and human locomotion biomechanics. ... I do not doubt that he would receive tenure and promotion at my institution."

Reviewer D: "...Elliott has made original, substantive, and important contributions to the field of wearable robotics, and powered prosthetics in particular. ... I rank him as among the best robotics designers in the world. ... I would strongly recommend him for tenure were he to be considered by my department."

Reviewer E: "I consider Prof. Rouse to be *the* most impactful [junior] researcher in prosthetic devices. ... He makes the University look good, he is respected by his peers, and he is a creative force within his field."

Reviewer F: "Dr. Rouse has made significant, important and valuable contributions to the research community with his work on hybrid dynamics and assistive robotics."

Summary of Recommendation: Professor Rouse is a very prominent and dedicated teacher and mentor, who is making ground-breaking impact with his research. It is with the support of the College of Engineering Executive Committee that I recommend Elliott J. Rouse for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.



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

May 2022