

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

Jesse S. Capecelatro, assistant professor of mechanical engineering, Department of Mechanical Engineering, and assistant professor of aerospace engineering, Department of Aerospace Engineering, College of Engineering, is recommended for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and associate professor of aerospace engineering, without tenure, Department of Aerospace Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2014	Cornell University, Mechanical and Aerospace Engineering, Ithaca, NY
M.S.	2012	Cornell University, Mechanical and Aerospace Engineering, Ithaca, NY
M.S.	2011	University of Colorado, Mechanical Engineering, Boulder, CO
B.S.	2009	State University of New York, Mechanical Engineering, Binghamton, NY

Professional Record:

2020 – present	Assistant Professor, Department of Aerospace Engineering, University of Michigan
2016 – present	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2016	Research Scientist, Center for Exascale Simulation of Plasma-Coupled Combustion, University of Illinois, Urbana, IL
2014 – 2016	Post-Doctoral Fellow, Center for Exascale Simulation of Plasma-Coupled Combustion, University of Illinois, Urbana, IL

Summary of Evaluation:

Teaching: Professor Capecelatro is passionate about engaging his students and sparking their interests in fluid mechanics. He teaches several courses at the graduate and undergraduate levels, including ME 523 (Computational Fluid Dynamics I). His teaching evaluation scores for his courses are a clear indicator of his exceptional classroom leadership. His students consistently praise his dedication, approachability, and passion, and named him the Pi Tau Sigma “Professor of the Term” for fall 2020. Professor Capecelatro is committed to teaching and has revived and modernized the graduate multiphase flows course (ME 527) and has contributed to the commonly used graduate fluid mechanic textbook. Professor Capecelatro is just as dedicated to his students having advised eight Ph.D. students, six M.S. students, four undergraduate students, and two postdocs. Three of his doctoral students have graduated including one who is now an assistant professor. Professor Capecelatro is an effective teacher in the classroom, using creative and innovative methods to enhance the curriculum, and provides excellent mentoring to students from diverse backgrounds.

Research: Professor Capecelatro’s research focuses on computational multiphase flows, with an emphasis on turbulent particulate flows, and has built a nationally recognized research program.

He systematically publishes in the top journals in the field, including *the Journal of Computational Physics*, the *Journal of Fluid Mechanics*, *Physical Review Fluids*, and *Physics of Fluids*. Professor Capecelatro's research on methods and models seamlessly integrates ideas from physics-based modeling and data driven techniques. He has developed physics-based models for particulate turbulence at both single-particle and many-particle levels, in the process also improving turbulence models. Additionally, by analyzing a variety of flows on unprecedented scales, his group created groundbreaking simulations of fluid-particle systems in extremely large domains with a reliability that has been unachievable until now. Ranging from disperse particle-laden flows to highly packed granular flows, these flows play essential roles in a variety of applications, including airborne disease transmission (including COVID-19), space exploration, and biomass pyrolysis. His work has potential for broad impact and widespread implementation. Professor Capecelatro has published an average of over six journal papers for the past four years and these papers tend to be substantially sized and in excellent journals such as the *Journal of Fluid Mechanics*. He has over 35 papers published in such high-quality journals, and several more submitted. Many of the papers that have already appeared are with his students and postdocs as the first author. His funding sources include the NSF, the Dow Chemical Company, the National Renewable Laboratory, NASA, and ONR. He is the recipient of many distinctive and prestigious awards, including a NASA Early Stage Investigation Award, ASME Pi Tau Sigma Gold metal, NSF CAREER Award, and the ONR Young Investigator Award.

Recent and Significant Publications:

- Beetham, S., and J. Capecelatro, "Formulating turbulence closures using sparse regression with embedded form invariance," *Physical Review Fluids*, 5, no. 8 (2020): 084611.
- Shallcross, Gregory S., Rodney O. Fox, and Jesse Capecelatro, "A volume-filtered description of compressible particle-laden flows," *International Journal of Multiphase Flow*, 122 (2020): 103138
- Yao, Yuan, and Jesse Capecelatro, "Competition between drag and Coulomb interactions in turbulent particle-laden flows using a coupled-fluid-Ewald-summation based approach," *Physical Review Fluids*, 3, no. 3 (2018): 034301.
- Lattanzi, Aaron M., Vahid Tavanashad, Shankar Subramaniam, and Jesse Capecelatro, "Stochastic models for capturing dispersion in particle-laden flows," *Journal of Fluid Mechanics*, 903 (2020).
- Yao, Yuan, and Jesse Capecelatro, "Deagglomeration of cohesive particles by turbulence," *Journal of Fluid Mechanics*, 911 (2021).

Service: Professor Capecelatro has served and is currently serving on the ME Undergraduate Program Committee (UPC), ME Junior Faculty Lunch Committee, and the ME Seminar Committee. He chaired the ME Seminar Committee for one year. He was a member of the Advanced Research Computing Advisory Team and the Online Academic Integrity Committee, both at the College level. At the university level, he also served as the point of contact for the COVID-19 Rapid Response Steering Committee. Professor Capecelatro has made notable contributions to DEI through activities aimed at encouraging participation of women and under-represented minorities in engineering. He co-organized the Women in Fluids Networking Lunch at the American Physical Society (APS) Division of Fluid Dynamics (DFD) for multiple years. He is serving his scientific community as a member of many professional organizations

including the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the American Physical Society, and the Association for Computational Mechanics. Professor Capecelatro has served on an NSF panel, as a reviewer for top-rated journals, including the *Journal of Fluid Mechanics*, and on other review committees for the NASA Space Technology Research Fellowship and the American Physical Society.

External Reviewers:

Reviewer A: “Jesse is an emerging leader [in his cohort] in the area of computational multiphase fluid mechanics and its use in solving complex flows of interest to industry. His scientific accomplishments and his dedicated service to the society make him an outstanding scholar of international reputation.”

Reviewer B: “On the basis of the excellent track-record he has built thus far, and even greater promise for the future, I give my unqualified recommendation for Professor Jesse Capecelatro to be promoted to associate professor with indefinite tenure.”

Reviewer C: “Jesse is in my view one of the sharpest and most accomplished [junior] computational scientists studying fluid dynamics in the world. He has already accomplished a great deal (in a short time) and enjoys tremendous potential for future impact and leadership.”

Reviewer D: “...Dr. Capecelatro has established himself as a recognized international leader in the fields of multiphase flow physics, modeling, and simulation.”

Reviewer E: “Prof. Capecelatro has already accumulated an extensive track record of high-quality publications that have quickly become influential in the community.... I regard Prof. Capecelatro as one of the very most promising faculty members [of his cohort] nationally in the field of fluid dynamics.... He is a rapidly rising star within the community, and there is no doubt in my mind that he will continue to make truly outstanding contributions.”

Summary of Recommendation: Professor Capecelatro is a passionate teacher, advisor, and mentor, who is making significant impact with his research. It is with the support of the College of Engineering Executive Committee that I recommend Jesse S. Capecelatro for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and associate professor of aerospace engineering, without tenure, Department of Aerospace Engineering, College of Engineering.



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

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