

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

Kira L. Barton, 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.	2010	University of Illinois, Mechanical Engineering, Urbana, IL
M.S.	2006	University of Illinois, Mechanical Engineering, Urbana, IL
B.S.	2001	University of Colorado, Mechanical Engineering, Boulder, CO

Professional Record:

2011-present	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2010-2011	Post-Doctoral Researcher, Mechanical Engineering, University of Illinois at Urbana-Champaign Urbana, IL

Summary of Evaluation:

Teaching: Professor Barton is an effective teacher and excellent advisor to our students. Since joining the University of Michigan, she has taught a core undergraduate course (ME360) and a graduate course (ME587). Students report that Professor Barton is a caring, organized and effective instructor. She has graduated three Ph.D. students and is currently advising another ten. She has also supervised many undergraduate and master's research projects. Her graduate students testify that she is a patient, dedicated and helpful advisor. Her mentorship is also well demonstrated through the papers she has published with her students.

Research: Professor Barton's primary research is on the application of iterative learning control to additive manufacturing based on electro-hydrodynamic jet printing, including both theoretical aspects of controller design and practical or engineering challenges of implementing such control on the printing technology. At Michigan, she has broadened into other applications of learning control as well as the fundamental physics of the E-jet printing. Recently, Professor Barton has applied learning control methodologies to cooperative control of multiple agents, rehabilitation robotics, and cloud-based manufacturing. Professor Barton has developed a strong research program at Michigan with significant and sustainable funding. She has won many external grants, from NSF and others, and has six pending research proposals under review. Professor Barton has been publishing research findings in high-quality journals in her field, with nine journal papers accepted/published (including two shorter papers in the high-quality journal, *Applied Physics Letters*) since joining U-M, and several more under review. Seven of these journal articles are with her students. She has also been active in publishing and presenting at various important conferences in her field. Professor Barton has developed a strong record in research and is showing excellent potential. External reviewers praise her outstanding research contributions and leadership in her field. Because of her research excellence, Professor Barton is the recipient of the Society of Manufacturing Engineers (SME) Outstanding Young Manufacturing Engineer Award as well as the NSF CAREER Award.

Recent and Significant Publications:

- D'Souza, K., Bayrak, A.E., Kang, N., Wang, H., Altin, B., Barton, K., Hu, J., Papalambros, P., Epureanu and B., Gerth, R., (2016), "An Integrated Design Approach for Evaluating the Utility and Cost of a Conventional and Modular Fleet," *Journal of Defense Modeling and Simulation*, Accepted.
- Hoelzle, D. and Barton, K., (2015), "On Spatial Iterative Learning Control via Two Dimensional Convolution: Stability Analysis and Computational Efficiency," *Control Systems Technology, IEEE Transactions on*, Pages: 1 - 9, DOI: 10.1109/TCST.2015.2501344, 2015.
- Tse, L. and Barton, K., (2015), "Airflow assisted printhead for high-resolution electrohydrodynamic jet printing onto non-conductive and tilted surfaces," *Applied Physics Letters*, 107(15), 054103.
- Tse, L. and Barton, K., (2014), "A field shaping printhead for high-resolution electrohydrodynamic jet printing onto non-conductive and uneven surfaces," *Applied Physics Letters*, 104(14), 143510.
- Altin, B. and Barton, K., (2014), "Robust iterative learning for high precision motion control through L1 adaptive feedback," *Mechatronics*, 24(6), 549-561.
- Lim, I., & Barton, K., (2014), "Pareto iterative learning control: Optimized control for multiple performance objectives," *Control Engineering Practice*, 26, 125-135.
- Parmar, G., Barton, K. and Awtar, S., (2014), "Large dynamic range nanopositioning using iterative learning control," *Precision Engineering*, 38(1), 48-56.
- Sutanto, E., Shigeta, K., Kim, Y. K., Graf, P. G., Hoelzle, D. J., Barton, K. L., Alleyne, A., Ferreira, P. and Rogers, J. A., (2012), "A multimaterial electrohydrodynamic jet (E-jet) printing system," *Journal of Micromechanics and Microengineering*, 22(4), 045008.
- Barton, K., Mishra, S., Alleyne, A., Ferreira, P. and Rogers, J., (2011), "Control of high-resolution electrohydrodynamic jet printing," *Control Engineering Practice*, 19(11), 1266-1273.
- Poellmann, M. J., Barton, K. L., Mishra, S. and Johnson, A. J. W., (2011), "Patterned hydrogel substrates for cell culture with electrohydrodynamic jet printing," *Macromolecular bioscience*, 11(9), 1164-1168.

Service: Professor Barton has been a great citizen. She has been a member and chair of the Departmental Seminar Committee and a member of the Faculty Search Committee for her department. At the college level, she has served on the Dean's Advisory Committee for Female Faculty (DACFF) and has co-organized the College of Engineering Control Seminar series. She was also a course leader for ME360. Professor Barton has demonstrated an active commitment to improving the climate for female and underrepresented faculty and students; participating on committees and workshops, advising many minority and female students, and seeking to improve diversity in her fields of control and manufacturing. Externally, Professor Barton has a record of service that exceeds expectations for junior faculty members at this stage of their career. She has been an associate editor for IFAC *Mechatronics* and has organized many symposia for the American Control Conference. She has served on many NSF panels, and has been a reviewer for various journals. She has co-chaired the 2014 Manufacturing Science and Engineering Conference/North American Manufacturing Research Conference (MSEC/NAMRC) (a major conference in the field of manufacturing) and served as a program committee member for the International Symposium on Flexible Automation (ISFA).

External Reviewers:

Reviewer A: "I consider Dr. Barton to be a leader in printing-based manufacturing, with a growing national and international visibility. ...Dr. Barton is already one of the top researchers in the emerging area, and certainly one of the top Assistant Professors in the printing-based additive

manufacturing area. She has already demonstrated that she can be an excellent scholar, and has been able to successfully integrate theoretical and applied research.”

Reviewer B: “Kira has excelled in the three major areas of an academic career: research, teaching, and service. Her research has been very impactful in 1) the modeling of an important additive manufacturing process, namely electrohydrodynamic jet printing...and 2) the advancement of iterative learning control, which is becoming increasingly popular for an ever wider range of applications.”

Reviewer C: “...among all the people working in ILC, Kira is in the top group of 4-6, both due to her scholarly contributions, but also due to her leadership.”

Reviewer D: “Professor Barton has made significant contributions in advances of iterative learning control for precision motion and manufacturing processes. She has contributed in rigorous nonlinear stability conditions for nonlinear repetitive processes that apply to iterative learning control and also established an analogue of the nonlinear repetitive process to the well-known result that the exponential stability of a nonlinear feedback system is equivalent to the exponential stability of the linearized dynamics.”

Reviewer E: “Professor Barton has made a series of significant contributions to the theory and application of iterative learning control (ILC). ...has also contributed to significant advancements in the modeling and characterization of complex additive manufacturing systems, which represent an important application target of ILC.”

Summary of Recommendation: Professor Barton is a great asset to the University of Michigan. She is an effective teacher and an excellent advisor. She has built a strong research program here with outstanding potential, and has been publishing high-quality papers. In service, she has been a great citizen in serving Michigan and the professional community. It is with the support of the College of Engineering Executive Committee that I recommend Kira L. Barton 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

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