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

Kira L. Barton, associate professor of robotics, with tenure, Department of Robotics, and associate professor of mechanical engineering, without tenure, College of Engineering, is recommended for promotion to professor of robotics, with tenure, Department of Robotics, and professor of mechanical engineering, without tenure, Department of Mechanical Engineering, College of Engineering.

Academic Degrees:
Ph.D.	2010	University of Illinois, Mechanical Engineering, Urbana-Champaign, IL
M.S.	2006	University of Illinois, Mechanical Engineering, Urbana-Champaign, IL
B.S.	2001	University of Colorado, Mechanical Engineering, Boulder, CO

Professional Record:
2022 – Present	Associate Professor (with tenure), Department of Robotics, University of Michigan
2022 – Present	Associate Professor (without tenure), Department of Mechanical Engineering, University of Michigan
2017 – 2022	Associate Professor (with tenure), Department of Mechanical Engineering, University of Michigan
2011 – 2017	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2010 – 2011	Post-doctoral Researcher, Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL,

Summary of Evaluation:
Teaching: Professor Barton integrates her research experience and commitment to DEI into her course lectures and mentoring of students. She has taught a broad range of core mechanical engineering subjects including manufacturing, dynamic systems, multidisciplinary design, and most recently, she is leading the design of the Robotics capstone course and its 300-level Tech Comm prerequisite. She has co-created several new courses, and significantly revised one existing course. The (co-) creation of three new classes over the course of 10 years is evidence of her commitment to teaching excellence and expanding the curriculum. She has graduated 15 Ph.D. students as the chair or co-chair with another 12 students in progress. She has mentored nine post-doctoral scholars and provided research experiences to 10 undergraduate students and over 25 masters students. Her students have won numerous awards.

Research: Professor Barton is an internationally recognized leader in Iterative Learning Control (ILC), multi-agent control systems, 3D printing, and cyber-physical manufacturing. Her research program features strong theoretical contributions and impressive simulations and experiments to achieve impactful instantiations of her teams' ideas. Since her last promotion, Professor Barton has published over 60 journal papers, as well as several refereed conference

papers, and reviewed abstracts. She has won two major international awards for her research, namely the Society of Manufacturing Engineer's 2022 One of 25 Leaders Transforming Manufacturing and the 2022 Manufacturing Leadership Award from the Manufacturing Leadership Council of the National Association of Manufacturers. She has supported her research program with significant extramural funding. Her current (active) grants and contracts alone total over $4M.

Recent and Significant Publications:
I. Kovalenko, E. C. Balta, D. M. Tilbury and K. Barton, "Cooperative product agents to improve manufacturing system flexibility: A model-based decision framework," *IEEE Transactions on Automation Science and Engineering* (2022).
I. Kovalenko, J. Moyne, M. Bi, E.C. Balta, W. Ma, Y. Qamsane, X. Zhu, Z.M. Mao, D.M. Tilbury, and K. Barton, "Toward an Automated Learning Control Architecture for Cyber-Physical Manufacturing Systems," *IEEE Access* 10 (2022): 38755-38773.
J. Moyne, Y. Qamsane, E.C. Balta, I. Kovalenko, J. Faris, K. Barton, and D. Tilbury, "A requirements driven digital twin framework: Specification and opportunities," *IEEE Access* 8 (2020): 107781-107801.
I.A. Spiegel, P. Sammons, and K. Barton, "Hybrid modeling of electrohydrodynamic jet printing," *IEEE Transactions on Control Systems Technology* 28.6 (2019): 2322-2335.
A. Berk, and K. Barton, "Exponential stability of nonlinear differential repetitive processes with applications to iterative learning control," *Automatica* 81 (2017): 369-376.

Service: Professor Barton has provided a high level of internal and external service. In the past three years alone, her internal service includes the ME DEI Committee, ME Faculty Search Committee, ARC associate director, ME Advisory Committee, Executive Committee of the Robotics Institute, and the CoE Robotics Future Initiative Committee. She has engaged in extensive external service to her profession, such as associate editor for two Tier 1 journals (*IEEE Transactions on Control Technology* and *IFAC Mechatronics*), program chair, co-chair, publicity chair or vice chair for student affairs for prestigious conferences and organizing several workshops and invited sessions. She has significant service enhancing DEI and outreach including the Dean's Advisory Committee on Female Faculty, designing exhibits for and serving on the board of the Ann Arbor Hands-On Museum, and developing learning modules, experimental demonstrations and hands-on learning opportunities for the Detroit Area Pre-College Engineering Program (DAPCEP).

External Reviewers:
Reviewer A: "She introduced 4 new Robotics and Smart Manufacturing courses and made major revisions to a 5th course on Global Manufacturing, in addition to handling a heavy course load of well-established Manufacturing classes. I am very impressed by the very high teaching evaluation scores that she has received."

Reviewer B: "The high quality of Dr. Barton's research work is evident from her publications. For example, her work on the exponential stability of Nonlinear Differential Repetitive Processes with Applications to Iterative Learning Control in [the journal] Automatica is exceptional."

Reviewer C: "The quality, quantity, focus and scholarly impact of Kira Barton's works is extremely high. Kira has made a substantial impact in the field of ILC, including both fundamental theory and introducing applications such as additive manufacturing. Her work on distributed decisions, optimality and robustness has been influential and widely cited."

Reviewer D: "The fundamental results of ILC define a problem rather rigidly, and effectiveness in applications comes from robustness of the algorithms. Kira Barton has pushed on these limits in her publications, one of which is specifically aimed at relaxing the fundamental assumptions. Others try to address other classes of objectives of importance, using multi objectives, automated learning architecture for cyber-physical manufacturing, microscale additive manufacturing, hybrid objectives. She blazes her own trail in these new directions. I consider her to be quite innovative in her research directions".

Reviewer E: "Kira and I both have worked in the area of ILC for many years. I have reviewed many of her papers. I am always amazed by the quality of her work as well as the spectrum of her research interests. She has made significant contribution[s] to spatial ILC from the problem formulation, analysis, design, and synthesis."

Summary of Recommendation:
Professor Barton is internationally recognized for her contributions to fundamental principles of manufacturing, she has been a dedicated and innovative teacher, and is an active citizen of the university and her profession. It is with the support of the College of Engineering Executive Committee that I recommend Kira L. Barton for promotion to professor of robotics, with tenure, Department of Robotics, and professor of mechanical engineering, without tenure, Department of Mechanical, College of Engineering.

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

May 2023