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

Approved by the Regents May 21, 2015

Nakhiah C. Goulbourne, assistant professor of aerospace engineering, Department of Aerospace Engineering, College of Engineering, is recommended for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2005	The Pennsylvania State University, Mechanical Engineering, State College, PA
M.S.	2004	The Pennsylvania State University, Mechanical Engineering, State College, PA
B.A.	2000	Middlebury College, Physics, Middlebury, VT (with Honors)

Professional Record:

2009 - present	Assistant Professor, Department of Aerospace Engineering, University of Michigan
2005 - 2009	Assistant Professor, Department of Mechanical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

Summary of Evaluation:
Teaching: Professor Goulbourne is a very dedicated and caring teacher who engages with students, and an effective mentor to her research students with a bar set at a high standard. She is a highly motivated teacher. Since her appointment at Michigan, Professor Goulbourne has taught the undergraduate structures class and has developed a new course in smart materials and structures that is being received well and fills a much needed void in the aerospace course offerings. She is also active with advising M.S. students and directing undergraduate major projects.

Professor Goulbourne's graduate students have praised her as a dedicated mentor and research advisor. They cite her willingness to spend considerable time with each of them and provide guidance and mentorship, in research and otherwise. Professor Goulbourne has successfully advised to completion two Ph.D. students, with another four slated to defend in the near future. In addition, she serves as a committee member for another three Ph.D. students.

Research: Professor Goulbourne's record of scholarly accomplishment is outstanding, with several high quality papers. Professor Goulbourne is an emerging leader in the area of soft-material mechanics including soft polymers, soft membranes, and hybrid composites for aerospace applications. Her work has a multi-disciplinary flavor. Professor Goulbourne has a strong record of publications, with many of her papers appearing in the top-rated journals in her field. Professor Goulbourne has published 19 journal papers, (several of these have been during her time at Michigan), 14 refereed conference papers, 24 conference papers refereed by abstract and 26 non-refereed conference presentations (abstract only). Both the quality and quantity of

her writings have contributed to her recognition as a very strong researcher and scholar in the smart materials community. Professor Goulbourne has successfully secured external sponsorship to carry out her research work. Prior to joining Michigan, Professor Goulbourne had already won the NSF CAREER award and secured several other research grants at Virginia Tech. Currently, her funding comes from NSF and the Air Force Office of Scientific Research (AFOSR). There is every indication that her ability to secure external research funding will continue and grow as she matures in her career.

Recent and Significant Publications:

R. Bhattacharya, R. Benitez, M. Radovic and N.C. Goulbourne, "High Strain-rate Response and Deformation Mechanisms in Polycrystalline Ti_2AlC," *Materials Science and Engineering: A*, 2013.

J.D. Davidson and N.C. Goulbourne, "A Nonaffine Network Model for Elastomers Undergoing Finite Deformations," *Journal of the Mechanics and Physics of Solids*, Vol. 61, 8, p. 1784-1797, 2013.

A. J. Skulborstad, S. Swartz and N. C. Goulbourne, "Determination of Fiber Kinematics with Simultaneous Surface and Subsurface Deformation Fields of Soft Tissue during Biaxial Extension," *Experimental Mechanics*, Vol. 53, p. 1405-1413, 2013.

Y. Wang, S. Son, S. M. Swartz and N.C. Goulbourne, "A Mixed Von Mises Distribution for Modeling Soft Biological Tissues with Two Distributed Fiber Properties," *International Journal of Solids and Structures*, Vol. 49, 21, p. 2914-2923, 2012.

J.D. Davidson and N.C. Goulbourne, "The Influence of Microstructure on Boundary Layer Interactions in Ionic Polymer Transducers," *International Journal of Applied Mechanics*, Vol. 3, 2, p. 365, 2011.

N.C. Goulbourne, "A Constitutive Model of Polyacrylate Interpenetrating Polymer Networks for Dielectric Elastomers," *International Journal of Solids and Structures*, Vol. 48, 7-8, p. 1085-1091, 2011.

Service: Professor Goulbourne is engaged and participating within her department as well as in several external roles within her research community. Professor Goulbourne has been engaged with her department serving on the successful 2010 faculty search committee, as the undergraduate advisor since 2010, and the Graduate Admissions Committee since 2012, among other assignments. Professor Goulbourne serves as a role model and is active in STEM related outreach. She has directly advised several women graduate and undergraduate students at Virginia Tech through an NSF REU. As part of her NSF CAREER grant, in 2009 she was engaged in a workshop in Jamaica to encourage girls, grades 9 through 10, to pursue science and engineering. Professor Goulbourne has provided external contributions as well. She continuously serves as a reviewer for the top journals in her field, as a panelist for both NSF and AFOSR, and on invitation-only DOD workshops. She is very active in the ASME Adaptive Structures and Material Systems Technical Committee (ASMS TC), which is the premier technical committee in her field. Professor Goulbourne was the primary organizer of the International Conference on Adaptive Structures and Technologies (ICAST) in 2013. She continues to build recognition and credibility within her research community at national and international arenas.

External Reviewers:
Reviewer A: "I anticipate that Professor Goulbourne will continue to grow in this area and become a leader of the field."

Reviewer B: "She has also some involvement with the research community as Conference Chair, SPIE Smart Structures and Materials Conference…also as Organizer for the SPIE/ASME Best Student Paper Award, among other involvements. These involvements ensure her visibility at the national and international level as one of the prominent [of her cohort] leaders in the field."

Reviewer C: "The University of Michigan is fortunate to have such a dedicated scholar and educator who continues to make a positive impact in all aspects of academia."

Reviewer D: "In this regard I note that my own research on electro-elastomers has benefitted considerably from my reading of Prof. Goulbourne's interesting work in the area, both theoretical and experimental. This body of work appears to be quite influential, original and timely."

Reviewer E: "She has made seminal contributions to a rapidly developing technology, and has broadened her scope of scholarship in recent years. I support her promotion with no reservation."

Summary of Recommendation: Professor Goulbourne is an excellent research mentor who has set the bar at a high level. She is on a very positive trajectory doing high quality and original research in soft material mechanics involving multi-physics attributes. She is emerging as a leader in the field of adaptive structures and smart materials. It is with the support of the College of Engineering Executive Committee that I recommend Nakhiah C. Goulbourne for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.

David C. Munson Jr.

David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2015