

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

Krzysztof J. Fidkowski, 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.	2007	Massachusetts Institute of Technology, Aeronautics and Astronautics, Cambridge, MA
S.M.	2004	Massachusetts Institute of Technology, Aeronautics and Astronautics, Cambridge, MA
S.B.	2003	Massachusetts Institute of Technology, Aeronautics and Astronautics, Cambridge, MA
S.B.	2003	Massachusetts Institute of Technology, Physics, Cambridge, MA

Professional Record:

2008 – present	Assistant Professor, Department of Aerospace Engineering, University of Michigan
2007 – 2008	Post-doctoral Associate, Aeronautics and Astronautics, Massachusetts Institute of Technology

Summary of Evaluation:

Teaching: Professor Fidkowski's teaching record is exceptional. He has taught required and elective undergraduate courses, and 500- and 600-level graduate courses, ranging in size from 18 to 108 students. He has a sustained record of outstanding teaching evaluations: his Q1 scores range from 4.59 to 4.95 and his Q2 scores range from 4.76 to 5.0. It is clear from student letters, that these scores are a reflection of his teaching philosophy, his innovation in the classroom, his thorough preparation and his ability to simultaneously challenge and support the students. He works to assess his teaching and further improve it. His work with CRLT includes midterm student evaluations in two of his classes, involvement in a teaching circle for teachers of large classes, and measuring the efficacy of concept questions and look-ahead assignments on student performance, under a CRLT grant that he was awarded. Professor Fidkowski has graduated one Ph.D. student, and currently has five students working towards their doctorate. He is also advising two post-doctoral scholars, and has been or is currently on 18 doctoral committees in five departments. Professor Fidkowski is off to a solid start on mentoring of graduate students and post-doctoral scholars, and is in high demand as a doctoral committee member for other faculty members' students. In his classroom teaching, he has already established himself as unusually talented, dedicated and effective.

Research: Professor Fidkowski's research is in the field of computational fluid dynamics. In particular, he focuses on high-order, solution-adaptive solvers for steady and unsteady flows, and uncertainty quantification for challenging applications; e.g. flows with turbulence, radiation transport, or phase change. He has contributed to the literature in mesh generation, criteria for solution adaptation, application of adjoints to solution adaptation, error estimation (particularly the separation of spatial and temporal error sources), discontinuous Galerkin methods, h-p adaptive schemes, and numerical analysis (particularly the mathematical connection between entropy variables and adjoints). Professor Fidkowski has published 18 journal articles, most of which are in top-tier journals such as *Journal of Computational Physics* and *AIAA Journal*. He also has over 20 refereed conference or symposium papers. A software package that he, his post-doctoral scientists and his students have developed is registered with the University of Michigan's Technology Transfer Office and is being disseminated under an open-source license.

Professor Fidkowski has attracted funding from a number of sources. His past grants include co-PI roles in a Phase II STTR and an Air Force Collaborative Center, and a co-I role in the CRASH Department of Energy Predictive Science Center. His current grants include sole-PI roles on a Department of Energy early career award and an Air Force Office of Scientific Research Young Investigator Award. He is also co-PI on a NASA grant, and co-I on CASL, a large, multi-university Department of Energy grant. The research group that he funds from these sources currently stands at five doctoral students and 1.5 post-doctoral scientists.

Professor Fidkowski has given nine external invited seminars in the U.S. and Europe, and four invited seminars at Michigan. His most-cited paper has 120 citations, and his publications taken together have more than 300 citations (per Scopus). His work is highly visible, as indicated by his winning two very competitive early-career awards

Recent and Significant Publications:

- S. M. Kast and K. J. Fidkowski, "Output-based mesh adaptation for high order Navier-Stokes simulations on deformable domains," *Journal of Computational Physics*, in press, DOI:0.1016/j.jcp.2011.03.0314(4).
- M. A. Ceze and K. J. Fidkowski, "An anisotropic hp-adaptation framework for functional prediction," *American Institute of Aeronautics and Astronautics Journal*, 51:492–509, 2013.
- K. J. Fidkowski and Y. Luo, "Output-based space-time mesh adaptation for the compressible Navier-Stokes equations," *Journal of Computational Physics*, 230:5753–5773, 2011.
- K. J. Fidkowski and P. L. Roe, "An entropy adjoint approach to mesh refinement," *SIAM Journal on Scientific Computing*, 32(3):1261–1287, 2010.
- K. J. Fidkowski T. A. Oliver, J. Lu and D. L. Darmofal, "p-Multigrid solution of high-order discontinuous Galerkin discretizations of the compressible Navier-Stokes equations," *Journal of Computational Physics*, 207:92–113, 2005.

Service: Professor Fidkowski's record in teaching and research, combined with his collegiality and conscientiousness, have already established him as a sought-after member of committees at the departmental, college and professional levels. At the departmental level, he has served on three ad hoc committees: a faculty search committee, a chair search advisory committee, and a committee for redesign of the departmental web site. Since 2012, he has been a member of the department's standing Undergraduate Curriculum Committee. At the college level, he has been sought out to serve on the CRLT in Engineering Advisory Board (since 2010), and the Classroom of the Future Committee. Both appointments reflect his reputation as someone who is making a very real contribution to pedagogy on campus. At the professional level, he has been highly active in the American Institute of Aeronautics and Astronautics (AIAA) and other organizations, having served as a member of six organizing committees for meetings, workshops and mini-symposia. He also served as chair of the AIAA Computational Fluid Dynamics Student Paper Competition in 2013. He is an active reviewer for several journals.

External Reviewers:

Reviewer A: "My view is that he is attacking difficult problems with considerable success. He is accomplishing this through a mastery of the underlying algorithmic techniques, which is the key to making what might seem at first glance straightforward ideas [work] on realistic problems."

Reviewer B: "In particular, his work on the p -multigrid solution of a high-order discontinuous Galerkin finite element discretization of the compressible Navier-Stokes equations is very well known, because of its significance for high Reynolds number flows and stretched grids. His cut-cell adaptive method for higher-order discontinuous Galerkin discretizations is also remarkable."

Reviewer C: "In conclusion, Chris has made a series of powerful and lasting contributions to create the capability for high-order adaptivity in large, complex, CFD simulations, in the process overcoming many mathematical and computational hurdles."

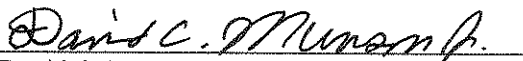
Reviewer D: "Prof. Fidkowski is one of the most talented people [of his cohort] working in the broad field of computational fluid dynamics today."

Reviewer E: "The results are impressive. He is, to my knowledge, the first to address the issue of hp adaptivity for aerodynamic flows, as well as the first to consider anisotropic refinement in a practical matter."

Reviewer F: "I found all of Dr. Fidkowski's papers to be rigorous, thoughtful, and to make a clear contribution."

Reviewer G: "In my opinion, Dr. Fidkowski is conducting some of the most interesting and promising research in the world toward one of the most important goals of CFD research."

Summary of Recommendation: Professor Fidkowski is an outstanding member of our faculty. He has made significant contributions to the field computational fluid dynamics. He is an exceptional teacher and mentor. He contributes both in external and internal service. It is with the support of the College of Engineering Executive Committee that I recommend Krzysztof J. Fidkowski for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.



David C. Munson, Jr.

Robert J. Vlasic Dean of Engineering
College of Engineering

May 2014