

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering

Krishnakumar R. Garikipati, associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering, and associate professor of mathematics, without tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering and professor of mathematics, without tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	1996	Stanford University, Aeronautics and Astronautics, Stanford, CA
M.S.	1992	Stanford University, Aeronautics and Astronautics, Stanford, CA
B. Tech	1991	Indian Institute of Technology, Aeronautical Engineering, Bombay, India

Professional Record:

2012 – present	Associate Professor (without tenure), Department of Mathematics, College of Literature, Science, and the Arts, University of Michigan
2006 – present	Associate Professor (with tenure), Department of Mechanical Engineering, College of Engineering, University of Michigan
2000 – 2006	Assistant Professor, Department of Mechanical Engineering, College of Engineering, University of Michigan

Summary of Evaluation:

Teaching: Professor Garikipati has taught a mix of undergraduate and graduate level courses at the University of Michigan. This includes an undergraduate core course in Mechanical Behavior of Materials (ME 382) and graduate courses in Theory of Solid Continua (ME511), Finite Element Methods (ME505) and Advanced Finite Element Methods (ME605). He has consistently received good marks on his Q1/Q2 teaching evaluations. The student letters also testified that he is an effective teacher who is enthusiastic, organized, and very good in articulating complicated materials in a way that students can understand and enjoy. His teaching achievement is also recognized by the awards he received, such as the Ruth and Joel Spira Teaching Award and the Pi Tau Sigma Professor Award.

Professor Garikipati has also demonstrated excellence in student advising and mentoring. He has graduated 12 Ph.D. students and has supervised three undergraduate student projects. Professor Garikipati's students have published with him in high quality journals. Letters from his graduate students testify that Professor Garikipati is an outstanding advisor – a person who has provided them with excellent guidance.

Research: Professor Garikipati is an eminent scholar and a leading researcher in computational mechanics. He is also establishing a strong reputation in the field of computational biology. He has made significant contributions to the modeling of discontinuities and the mechanics of electronic materials. The variational multiscale methods that he has developed have been well recognized by the technical community for their computational elegance and adherence/connection to the essential physics of the problems at hand. In addition, Professor Garikipati is currently working on a project in the coupled mechano-chemistry of batteries and semiconductors, which is another area with great potential. He is now expanding his research and forming a group to focus on problems of cell mechanics and tumor growth. This is achieved through collaboration with others across disciplines, leading the creation of a

cell mechanics cluster via interdisciplinary faculty hiring. The rigor, quality, and impact of his work are well-respected by his peers. His stature and recognition in the research community are also demonstrated by the prestigious awards he has received (the Alexander von Humboldt Research Fellowship and the NSF PECASE Award) and the many invited talks he gave internationally.

Professor Garikipati's research program at Michigan is funded by various agencies, such as NSF, DoE, NASA, Boeing, and the Sandia National Lab. His funding level is adequate for him to maintain a productive computational research program, resulting in a strong publication record with 40 archival journal papers in high impact and high quality journals. Since his work has made significant contributions to fundamental knowledge, it has been praised by eminent scholars and his papers are well cited by his peers. His publication citation number is high (highest citation per paper = 150) for a person in his technical field and at his career stage.

Recent and Significant Publications:

- K.L. Mills, K. Garikipati and R. Kemkemer, "Experimental characterization of tumor spheroids for studies of the energetics of tumor growth," *International Journal of Materials Research*, vol. 7, pp. 889-895, 2011.
- D. Ambrosi, G. A. Ateshian, E. M. Arruda, S. C. Cowin, J. Dumais, A. Goriely, G. A. Holzapfel, J. D. Humphrey, R. Kemkemer, E. Kuhl, J. E. Olberding, L. A. Taber and K. Garikipati, "Perspectives on biological growth and remodeling," *Journal of the Mechanics and Physics of Solids*, vol. 59, pp. 863-883, 2011.
- J. E. Olberding, M. D. Thouless, E. M. Arruda and K. Garikipati, "The non-equilibrium thermodynamics and kinetics of focal adhesion dynamics," *PLoS ONE*, vol. 5, e12043, 2010.
- H. Narayanan, S. N. Verner, K. L. Mills, R. Kemkemer and K. Garikipati, "In silico estimates of the free energy rates in growing tumor spheroids," *Journal of Physics Condensed Matter*, Special Issue on cell-Substrate Interactions, vol. 22, p 194122, 2010.
- S.S. Rudraraju, A. Salvi, K. Garikipati and A. M. Waas, "In-plane fracture of laminated fiber-reinforced composites with varying fracture resistance: Experimental observations and numerical crack propagation simulations," *International Journal of Solids and Structures*, vol. 47, pp. 901-911, 2010.
- A. van der Ven, K. Garikipati, S. Kim and M. Wagemaker, "The role of coherency strains on phase stability in LiFePO_4 : Needle crystallites minimize strain energy and overpotential," *Journal of the Electrochemical Society*, vol. 156, issue 11, pp. A949- A957, 2009.
- K. Garikipati, "The kinematics of biological growth," *Applied Mechanics Review*, vol. 62, pp. 030801-1-030801-7, 2009.
- B. Puchala, M.L. Falk and K. Garikipati, "Elastic effects on relaxation volume tensor calculations," *Physical Review B*, vol. 77, issue 17, article no. 174116, 2008.
- H. Narayanan, K. Grosh, E. M. Arruda and K. Garikipati, "The micromechanics of fluid-solid interactions during growth in porous soft biological tissue," *Biomechanics and Modelling in Mechanobiology*, vol. 8, issue 3, pp. 167-181, 2009.
- S. de Miranda, K. Garikipati, L. Molari and F. Ubertini, "A simple solution strategy for coupled piezo-diffusion in elastic solids," *Computational Mechanics*, vol. 44, 2, pp. 191-203, 2009.

Service: Professor Garikipati has been a good citizen, actively serving the University of Michigan and his technical community. One of his recent major service contributions was to provide leadership in developing the Multiscale Cell Mechanics Faculty Search Cluster, a successful proposal for the Provost's Interdisciplinary Faculty Initiative. In addition, Professor Garikipati has served on several faculty search committees, a chair search committee, an IT committee, a reappointment casebook committee, and the Undergraduate Program Committee. From 2009 to 2010, he chaired his department's faculty search committee which was successful in attracting two candidates. Professor Garikipati has served on the Computing Executive Committee for the College of Engineering and on the Faculty Committee for Non-

Traditional Fellowship Selection for the University. He has also been active in serving his technical field and research community. He has co-organized an important IUTAM Symposium on Cellular, Molecular, and Tissue Mechanics in 2008. This workshop resulted in a book published by Springer, of which Professor Garikipati was a co-editor. He also served as a guest editor for a special issue of Philosophical Transactions of the Royal Society entitled, "Biomechanics: from Cells to Tissues." Professor Garikipati has also served as an associate editor for the ASME *Journal of Applied Mechanics*, a leading journal in the field of mechanics, and served on various NSF review panels in both Bioengineering and Mechanical Engineering.

External Reviewers:

Reviewer A: "I have very high regard and respect for his research style which combines rigorous mechanics and physics with state-of-the-art computational techniques...His work has made significant impact...His theory has injected new life into the classical continuum mechanics and helped revive the field in various applications in biology and biomedical engineering."

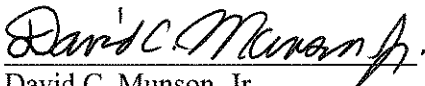
Reviewer B: "...one of the highest-impact Dr. Garikipati achieved was based on studies with strong discontinuities in finite strain plasticity...Several research groups have adopted the underlying idea."

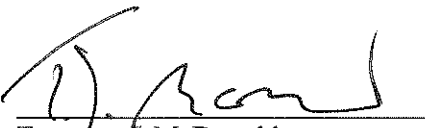
Reviewer C: "I dare say that few investigators working at his level of sophistication can claim expertise in so many different areas of mechanics."

Reviewer D: "I would tend to view him as a versatile researcher in computational mechanics."

Reviewer E: "Dr. Garikipati is a highly distinguished and internationally renowned scientist..."

Summary of Recommendation: Professor Garikipati is an eminent scholar and an internationally renowned researcher in computational mechanics and computational biology. He has a strong publication record with high citations. The quality of his research is highly praised by his peers. Professor Garikipati is a well-respected and effective teacher and is a great mentor. He has been a good citizen, contributed to the University of Michigan and the professional communities with a wide variety of activities. It is with the support of the College of Engineering Executive Committee that I recommend Krishnakumar R. Garikipati for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering and professor of mathematics, without tenure, College of Literature, Science, and the Arts.


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


Terrence J. McDonald
Arthur F. Thurnau Professor, Professor of
History, and Dean, College of Literature,
Science, and the Arts

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