PROMOTION RECOMMENDATION
University of Michigan
College of Engineering

Krishnakumar R. Garikipati, 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

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

Professional Record

2000-present	Assistant Professor of Mechanical Engineering, University of Michigan
1998-1999	Research Associate, Stanford University
1996-1998	Post Doctoral Student, Stanford University
1992-1996	Graduate Research Assistant, Stanford University

Summary of Evaluation:

Teaching: Professor Garikipati's teaching record is outstanding. He is often called upon to teach our large, required, four-credit undergraduate mechanics of materials course, which is a fast-paced, dense introduction to the use of engineering materials in design. Professor Garikipati's teaching evaluations exceed the average of all instructors for this course; his Q2 scores are significantly higher than the course average. At the time of his three-year review Professor Garikipati's average Q2 scores for all classes placed him among the best in the department, and since then, his Q2 scores have increased. His teaching quality has been recognized by both the Ruth and Joel Spira Teaching Award and the Pi Tau Sigma Professor of the Term Award. Professor Garikipati has also been a conscientious mentor to undergraduate and graduate students via informal and formal mentoring activities. Current and former PhD students in his program offer pointed comments in their letters about the effectiveness of Professor Garikipati's efforts as an academic advisor.

Research: Professor Garikipati's research is primarily in the fields of coupled microscale physical processes, advanced finite element methods, and plasticity. His approach meets the most rigorous standards and involves a strong analytical knowledge of continuum mechanics coupled with modern computational techniques. He has recently expanded his research agenda to explore coupled microscale physics in biological tissue, demonstrating both a breadth of talents and the ability to choose important problems. Professor Garikipati has an overall outstanding publication record with 24 articles published or appearing in archival journals. He should be commended for publishing the majority of his manuscripts in the premier journals within the mechanics and computational method communities. He has more than 218 citations to date, a record which is exceedingly high for someone at his career stage, indicating that his work is very visible and highly regarded in the field, thus placing him on a trajectory to emerge as an international leader. The caliber of his research efforts has been recognized by the prestigious Presidential Early Career Award from DOE and the Alexander von Humboldt Fellowship. The significant impact of his research is evidenced by his 19 invited seminars at prestigious academic institutions, including 13 in Europe.

It is clear from the comments of the external reviewers that Professor Garikipati has established himself as one of the best and brightest young computational mechanics investigators in the world. Each letter writer was not only wholly positive in support of Professor Garikipati, but detailed and specific in his or her praise of Professor Garikipati's research contributions. This diverse group of eminent researchers in fields spanning a significant breadth of solid mechanics is well-versed in his work and quite familiar with him through interactions at technical meetings. Each external reviewer also explicitly supported granting Professor Garikipati tenure at this time and no reservations were expressed.

Recent and Significant Publications:

Garikipati, K., J. E. Olberding, H. Narayanan, E. M. Arruda, K. Grosh and S. Calve, "Biological remodelling: Stationary energy, configurational change, internal variables and dissipation," accepted in *Journal of the Mechanics and Physics of Solids*, 2005.

Mourad, H., J. Dolbow and K. Garikipati, "An assumed gradient finite element method for the level set equation," *International Journal for Numerical Methods in Engineering*, vol. 64, pp 1009-1032, 2005.

Kuhl, E., K. Garikipati, E. M. Arruda and K. Grosh, "Remodelling of biological tissue: Mechanically-induced reorientation of a transversely isotropic chain network," *Journal of the Mechanics and Physics of Solids*, vol. 53, pp 1552-1573, 2005.

Wells, G. N., K. Garikipati and L. Molari, "A discontinuous Galerkin formulation for a strain gradient-dependent damage model," *Computer Methods in Applied Mechanics and Engineering*, vol. 193, pp 3633-3645, 2004.

Garikipati, K., E. M. Arruda, K. Grosh, H. Narayanan and S. Calve, "A continuum treatment of growth in biological tissue: Mass transport coupled with mechanics," *Journal of the Mechanics and Physics of Solids,* vol. 52, no. 7, pp 1595-1625, 2004.

Garikipati, K., "Couple stresses in crystalline solids: Origins from plastic slip gradients, dislocation core distortions, and three-body interatomic potentials," *Journal of the Mechanics and Physics of Solids*, vol. 51, no. 7, pp 1189-1214, 2003.

Garikipati, K., "Variational multiscale methods to embed the macromechanical continuum formulation with fine scale strain gradient theories," *International Journal for Numerical Methods in Engineering*, vol. 57, no. 9, pp 1283-1298, 2003.

Regueiro,R. A., D. J. Bammann, E. B. Marin and K. Garikipati, "A Nonlocal Phenomenological Anisotropic Finite Deformation Plasticity Model Accounting for Dislocation Defects," *Journal of Engineering Materials and Technology*, ASME, vol. 124, pp 380-387, 2002.

Engel, G., K. Garikipati, T. J. R. Hughes, M. G. Larson, L. Mazzei and R. L. Taylor, "Continuous/Discontinuous Finite Element Approximations of Fourth-order Elliptic Problems in Structural and Continuum Mechanics with Applications to Thin Beams and Plates, and Strain Gradient Elasticity," *Computer Methods in Applied Mechanics and Engineering*, vol. 191, no. 34, pp 3669-3750, 2002.

Garikipati, K., "A Variational Multiscale Method to Embed Micromechanical Surface Laws in the Macromechanical Continuum Formulation," *Computer Modelling in Engineering and Sciences*, vol. 3, no. 2, pp 175-184, 2002.

Service: Professor Garikipati's service record to date is considered appropriate for an assistant professor. He served with dedication as the ME faculty advisor at the Engineering Advising Center for two years and as a member of the Undergraduate Program Committee. He has competently organized the ME Department and Midwest Mechanics seminar series. He has also enthusiastically contributed to journal and proposal reviews, as well as being an organizer of conference sessions for professional societies.

External Reviewers:

Reviewer (A): "It also clearly shows the care he brings to related numerical computations. In short, I really like this work very much, and I will recommend it to anyone seriously interested in comparing continuum calculations to discrete lattice computations."

Reviewer (B): "...I would like to call your attention to other papers I have read. The first is a paper by Garikipati and Armero that describes the large strain formulation of embedded discontinuities. The extension of the embedded strain formulation is not straight forward, and the authors did this in an elegant, general manner. The paper is quite striking in its maturity for having been written by two researchers [of their generation]." "The second is Garikipati's recent paper with Tom Hughes on the application of discontinuous Galerkin formulations to plates. The paper makes a novel contribution of using the discontinuous formulation only for some of the variables, so that it is much more powerful than a complete discontinuous Galerkin approach." "Overall I would rate him among the 'star' researchers among those in their [cohort]."

Reviewer (C): "Dr. Garikipati has also done excellent research in many other areas of computational mechanics. His work is characterized by rigorous mathematical formulations, creative algorithms and insightful numerical tests. He is uncommonly strong in mathematics and computing, and has very good taste in choosing his research topics. In short, he is one of the best of the new breed of computational scientists who are extremely well-suited for interdisciplinary research and who will play an increasingly important role in future scientific research."

Reviewer (D): "He is one of the brightest engineering scientists [of his generation] in the country and he promises to be scientific leader in academia."

Reviewer (E): "The impression I have is that his numerical methods in this area are probably the most carefully developed and the most sophisticated hat have been developed."

Summary of Recommendation: Professor Krishnakumar R. Garikipati has a solid and well-rounded record in teaching, research and service. He has established a strong foundation for what promises to be a fruitful career at the University of Michigan. He has a strong potential to continue to make significant contributions in his field, and to emerge as an international leader in academia. His passion for and commitment to teaching is unquestionable, and his service contributions are significant. It is with the support of the College of Engineering Executive Committee that I recommend him for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.

Ronald Gibala
Interim Dean, College of Engineering

May 2006