

IOWA STATE UNIVERSITY

Agricultural and Biosystems Engineering

D. Raj Raman, PE

Morrill Professor

3356 Elings Hall
515-294-0465
rajraman@iastate.edu
www.abe.iastate.edu

Education

Ph.D. Biological Engineering, 1994
Cornell University

B.S. Electrical Engineering, 1986
Rochester Institute of Technology

Honors and Awards

Massey-Ferguson Educational Gold Medal Award from the American Society of Agricultural and Biological Engineers (2016)

Nominated for and attended the *National Academy of Engineering Frontiers of Engineering Education* symposium, recognizing the innovative practices in engineering (2013)

Recent Publications

Haughery, J. R., and **D. R. Raman**. 2019. Incremental Cost Analysis of First-Year Course Innovations. *International Journal of Engineering Education* 35(1A): 209 – 220

Christiansen, K. A., **D. R. Raman**, G. Hu, and R. P. Anex. 2018. First-Order Estimates of the Costs, Input-Output Energy Analysis, and Energy Returns on Investment of Conventional and Emerging Biorenewable Feedstocks. *Energy Policy* 5(4): 894 – 899

Dohmen, A. E. and **D. R. Raman**. 2018. Healthy food as a New Technology – the implications of technological diffusion and food price for changes in eating habits. *Frontiers in Nutrition, section Nutrition and Environmental Sustainability* 5 article 105.

Law, J. Y., M. L. Soupir, **D. R. Raman**, and T. B. Moorman. 2018. Exploring multiple operating scenarios to identify low-cost, high nitrate removal strategies for electrically-stimulated woodchip bioreactors. *Ecological Engineering* 120: 146 – 153

Matthiesen, J, Suastegui, M., Wu, Y., Viswanathan, M., Qu, Y., Cao, M., Rodriguez-Quiroz, N., Okerlund, A., Kraus, G., **Raman, D. R.**, Shao, Z., and Tessonnier, J. P. 2016. Electrochemical Conversion of Biologically-Produced Muconic Acid: Key Considerations for Scale-up and Corresponding Technoeconomic Analysis. *ACS Sustainable Chemistry & Engineering* 4(12): 7098 – 7109

Kaleita, A. L., G. R. Forbes, E. Ralston, J. Compton, D. Wohlgemuth, and **D. R. Raman**. 2016. Pre-enrollment identification of at-risk students in a large engineering college. *International Journal of Engineering Education* 32(4): 1647 – 1659

Raman, D. R., Geisinger, B. N., Kemis, M. R., and de la Mora, A. 2016. Key actions of successful summer research mentors. *Higher Education* 72(3): 363 – 379

Teaching

In addition to teaching across the curriculum (e.g., ABE 160, 316, 380, 415, 418, 480, TSM 363) Professor Raman has extensive program development and accreditation experience. He led the development of the new Biological Systems Engineering (BSE) degree program, which was approved by the Board of Regents in summer 2008 and accredited in 2012; the program now enrolls over 100 students with over 50% women in the program. Since 2009 he has chaired the ABE Engineering Curriculum Committee (ECC) which oversees the ABET accreditation process for both the Agricultural Engineering (A E) and BSE degree programs.



During his 10 years of service as University Education Director for the NSF Engineering Research Center for Biorenewable Chemicals (CBiRC), he developed a new graduate minor and directed a large REU (research experience for undergraduates) site with 120+ total alumni. He also co-directed an ABE-focused REU program which graduated an additional 30+ students, and he served as Education Co-Director for the USDA NIFA CAP program *Sustainable Production and Distribution of Bioenergy for the Central USA (CenUSA)*, which graduated another 60+ summer interns. He has conducted scholarship related to his teaching efforts, including in the realms of curriculum structure, undergraduate research mentoring, and student success prediction.

Research

By developing a technoeconomic model of fermentation and catalysis, Raman and his students were able to predict how product price varies with critical biokinetic parameters; relations that were critical to CBiRC's R&D decisions. Since 2018, Raman has been working with colleagues in Agronomy on perennial groundcover (PGC) systems for row crops. Pioneered by Distinguished Professor Ken Moore and collaborators, PGC approaches have the potential to transform production agriculture by moving away from the bare-earth approaches that cause multiple unintentional consequences. Unlike annual cover crops, PGC approaches do not require planting in late fall, or harvesting in early spring, and provide a more continuous layer of protection to critical soil resources.

Recent Projects

Since coming to Iowa State University in January 2006, Raman has secured over \$15M in teaching grants. He began by leading a \$490k USDA Higher Education Challenge Grant, and then had an educational leadership role and on two large federal projects related to biorenewables: CBiRC, a 10-year, \$37M project, and CenUSA, a 5-year \$20M project. He has worked to improve science teaching in Iowa K-12 schools, which he believes is crucial to a strong state and nation. In this area, he was a co-investigator on the \$5M NSF STEM-C Program entitled *Teachers and Engineers Collaborating in STEM Elementary Teacher Preparation*. He is involved in college- and university-level efforts to predict student success and to thereby provide better guidance and support to students who are at risk; he continues to be involved in campus-wide efforts to increase the diversity of STEM-field students at ISU.