

PROMOTION RECOMMENDATION
The University of Michigan – Flint
College of Arts and Sciences
Department of Computer Science, Engineering, and Physics

Tariq Shamim, associate professor of mechanical engineering, with tenure, Department of Computer Science, Engineering, and Physics, College of Arts and Sciences, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Computer Science, Engineering, and Physics, College of Arts and Sciences.

Academic Degrees:

Ph.D.	1997	University of Michigan
M.S.E.	1996	University of Michigan
M.A.Sc.	1992	University of Windsor, Ontario Canada
B.Eng.	1988	University of Engineering & Technology, Karachi, Pakistan

Professional Record:

2017-Present	Associate Professor of Mechanical Engineering, with tenure, and Associate Chair Department of Computer Science, Engineering, and Physics, University of Michigan- Flint
2017-Present	Adjunct Faculty of Mechanical Engineering, Khalifa University of Science & Technology, Abu Dhabi, UAE
2010-2017	Professor of Mechanical Engineering, Masdar Institute of Science & Technology, Abu Dhabi UAE
2007-2015	Faculty Affiliate, University of Michigan Energy Institute, University of Michigan
2003-2012	Associate Professor of Mechanical Engineering, with tenure, University of Michigan- Dearborn
1997-2003	Assistant Professor of Mechanical Engineering, University of Michigan-Dearborn

SUMMARY OF EVALUATION

Teaching: Professor Shamim is a dedicated teacher who takes enormous pride in his work to train tomorrow's leaders and engineers. Equally important, he has internalized a deep sense of responsibility for his role as a teacher and the trust afforded to him as such by society and his students. Professor Shamim is committed to maintaining a thorough knowledge of his subject, being well prepared, creating an environment conducive to learning, and being fair in his assessment of student performance. His pedagogy emphasizes his belief that students must develop their capacities for problem solving, independent thinking and asking the right questions – in addition to a command over the subject matter. Professor Shamim's dedication and effectiveness as a teacher are evidenced in his teaching evaluations. While serving as the chair of the Mechanical Engineering program at the Masdar Institute of Science and Technology, Professor Shamim received evaluation averages of 3.39 and 3.59 respectively (on a 1-4 scale), across his seven courses, for the questions addressing the overall value of the course and the overall quality of the teaching. On more specific questions addressing his effectiveness as a teacher, Professor Shamim averaged 3.60 on the question regarding his command over the subject matter, 3.64 for the item covering his preparation and 3.57 for the question on the organization of delivering class material. During his tenure at the University of Michigan-Dearborn, Professor Shamim reports his evaluation scores across thirty-six courses for the question addressing the overall quality of the course and teaching. Between the Fall of 2003 and the Winter semester of 2009, Professor Shamim averaged 3.53 to this question (on a 1-4 scale). Furthermore, the value of Professor Shamim's pedagogical principles were clearly appreciated by his students. As noted by one of his students in his Thermodynamics course at the

University of Michigan-Dearborn, “Splitting time between lecturing and just examples was extremely useful.” Professor Shamim’s commitment to student learning is also apparent from this comment from a student in his Thermal Fluids Science II course, “Very good experience; summer so it was difficult but professor was always prepared and spent time to help students if they could spend time.” Finally, from his recent peer evaluation of his teaching, his colleague commented “His teaching materials are very clear and well-thought out and extremely well organized. He regularly imparts intuitive examples to mesh with the theory to allow the students to quickly grasp the materials.”

As noted above, Professor Shamim has an extensive and distinguished record of teaching. He has taught twenty 20 different courses ranging from a lower level thermodynamics course to graduate level courses in combustion, heat transfer, and engine emissions. Of these twenty 20 courses, seven were newly developed by Professor Shamim. To keep the curriculum up-to-date, he is currently proposing a new thermodynamics laboratory course, as well as an undergraduate course covering sustainable energy and the environment. Throughout his career, Professor Shamim has supervised seven Ph.D. students, 35 Masters’ students, and has worked with nearly 20 undergraduate students conducting research. While Professor Shamim’s record of teaching effectiveness is very impressive for the quantity of courses and students he has supervised, he has also been nationally recognized for the quality of his teaching as evidenced by being awarded the Ralph R. Teetor Educational Award. This award by the Society of Automotive Engineers International recognizes young scholars for their contributions to teaching and curriculum development, their research and professional development, and their leadership in student activities and participation in engineering society activities.

Research: Professor Shamim is a mechanical engineer specializing in the modeling of energy systems and reacting flows. This scholarly activity is motivated by the need to develop sustainable energy conversion solutions and emission control methodologies. More specifically, Professor Shamim’s research encompasses the areas of carbon capture and storage, combustion and advanced energy systems, thermochemical energy storage, emission control techniques, and computational heat transfer and fluid flow. With 58 journal articles, two books, 60 referred conference proceedings, 39 non-referred conference presentations, and 45 invited presentations, to say that Professor Shamim’s record of scholarly activity is extensive would be an understatement. In addition to this scholarly productivity since 1997, Professor Shamim has been included in grant funded research projects totaling over \$8.5 million dollars – over \$6 million as either the principal investigator or a member of the research team – spanning 34 grants from such prestigious sources as the National Science Foundation, the U.S. Department of Energy and the U.S. Department of Defense.

Recent and Significant Publications:

- Yan, J., Shamim, T., Chou, S.K., and Li, H., (Editors), 2015, *Energy Procedia: Clean, Efficient and Affordable Energy for a Sustainable Future: The 7th International Conference on Applied Energy (ICAE2015)*, Volume 75, pp. 1-3328.
- Shamim, T., 2006 “Modeling of Three-Way Catalytic Converter System,” in: *Technologies for Near-Zero-Emission Gasoline-Powered Vehicle*, Zhao, F. (editor), SAE, Warrendale, PA.
- Shamim, T., 2004, “Catalytic Converter System Modeling,” in: *Advanced Developments in Ultra-Clean Gasoline-Powered Vehicles*, Zhao, F. (editor), SAE, Warrendale, PA.
- Akhtar, S., Khan, M. N., Kurnia, J. C., and Shamim, T., 2017, “Numerical Investigation of Energy Conversion and Flame Stability in a Curved Micro-Combustor for Thermophotovoltaic (TPV) Applications,” *Applied Energy*, 192:134-145.
- Hassan, B., Ogidiama, O. V., Khan, M. N., and Shamim, T., 2017, “Energy and Exergy Analyses of a Power Plant with Carbon Dioxide Capture Using Multistage Chemical Looping Combustion,” *ASME Journal of Energy Resources Technology*. 139(3):032002.1-032002.9.
- Sasmitho, A. P., Kurnia, J. C., Shamim, T., and Mujumdar, A. S., 2017, “Optimization of Design Parameters

for an Open-Cathode Polymer Electrolyte Fuel Cells Stack utilizing Taguchi Method,” *Applied Energy*, 185:1225-1232.

Yan, J., Shamim, T., Chou, S.K., Desideri, U., and Li, H., 2017, “Clean, Efficient and Affordable Energy for a Sustainable Future,” *Applied Energy*, 185:953-962.

Khan, M. N., and Shamim, T., 2017, “Exergoeconomic Analysis of a Chemical Looping Reforming Plant for Hydrogen Production,” *International Journal of Hydrogen Energy*, 42:4951-4965.

Khan, M. N., and Shamim, T., 2017, “Thermodynamic Screening of Suitable Oxygen Carriers for a Three Reactor Chemical Looping Reforming System,” (in press) *International Journal of Hydrogen Energy*.

Akhtar, S., Piffaretti, S., and Shamim, T., 2017, “Numerical Investigation of Flame Structure and Blowout Limit for Lean Premixed Turbulent Methane-air Flames under High Pressure Conditions,” (under review) *Applied Energy*.

Service: Professor Shamim has a distinguished record of substantive leadership and service to his academic institutions and his professional community. Most recently, he has served between 2014 and 2016 as the interdisciplinary Ph.D. program coordinator at the Masdar Institute of Science and Technology (MIST), Abu Dhabi, UAE. Prior to joining the university, Professor Shamim was the founding program head for the Mechanical Engineering program at MIST between 2010 and 2014. Earlier in his career at the University of Michigan-Dearborn, Professor Shamim was the chair of the Graduate Program in the Department of Mechanical Engineering between 2005 and 2006, and the acting department chair, Department of Mechanical Engineering, from May 2005 through August 2009. During his tenure at the University of Michigan-Dearborn, Professor Shamim also assumed numerous leadership roles as a governing faculty member, serving as the chair and vice chair of the Faculty Senate, the chair of the Faculty Senate Council, and Chair of the University Promotion and Tenure Committee. Within his professional community, Professor Shamim has made significant contributions by serving as a subject editor for *Applied Energy* – a top energy journal. He has also served on the editorial board of the prestigious Combustion Institute Proceedings. Furthermore, he has organized many technical sessions at prestigious international technical conferences.

External Reviewers:

Reviewer A: “One group of publications that I find particularly outstanding is those relating to analysis of energy usage and efficiency of industrial-scale chemical looping combustion and chemical looping reforming plants... The models that Prof. Shamim has developed are more comprehensive, and in my view the more representative of true industrial implementation. ... Within his field of energy systems modeling, I would estimate his standing to be in the top 20% worldwide.”

Reviewer B: “The breadth of his publications is very noteworthy and is a good indication that he will continue to be an active scholar and a respected contributor in the archival literature. ... He seems to be a master of the fundamentals of energy conversion, and I have no doubt that, when he concentrates in a specific area he will be very well regarded by his peers and that, in time he will rise to leadership positions in his area.”

Reviewer C: “Prof. Shamim’s CV and publication list indicate that his research has been very productive especially over the period from 2013 to the present and, in my view, this level of output is certainly commensurate with the rank of Full Professor. ... Prof. Shamim produces a high volume of work of consistent quality... His best work concerns the performance of PEM fuel cells. Here a publication from 2012 was amongst the top 10 downloads from the journal website whilst his most cited publication is ‘Effect of operating parameters on the transient performance of a polymer electrolyte membrane fuel cell stack with a dead-end anode’ published in *Applied Energy* in 2014.”

Reviewer D: “During his professional career, he has made significant scholarly contributions to the areas of clean energy systems and emission control. He has published consistently high-quality work in several high-

quality journals such as *Applied Energy*, *Energy Conversion & Management*, *Journal of Power Sources*, *International Journal of Hydrogen Energy*, *ASME Transactions*, *SAE Transactions*, etc. ... Dr. Shamim has a significant standing in his field. At the international level, this is shown by his appointment as a Subject Editor of a leading journal in the energy area: *Applied Energy* (impact factor of 7.182). This is in addition to his election as a Fellow of the American Society of Mechanical Engineers (ASME), his invited speeches, and his service as reviewer for several leading journals and funding agencies."

Reviewer E: "Dr. Shamim's research interests are in the broad area of energy and sustainability with specific focus on carbon capture, combustion and emissions control, energy storage, and fuel cells. He has an excellent publication and funding record which is consistently improving." ... Some of his recent work has potential for making significant impacts in the field. For example, he is working on the development of an innovative carbon capture method by using solar energy-integrated chemical looping combustion (CLC) which will have very low energy penalty."

Summary of Recommendation: Professor Shamim is a mechanical engineer specializing in the areas of carbon capture and storage, combustion and advanced energy systems, thermochemical energy storage, emission control techniques, and computational heat transfer and fluid flow. Professor Shamim's extensive record of peer reviewed publications and research grants places him in the top twenty percent in his field worldwide. Professor Shamim's portfolio also presents strong evidence of outstanding teaching with his supervision of graduate and undergraduate research being particularly noteworthy. Finally, Professor Shamim has an exemplary record of leadership and service to his departments, universities and professional community. In summary, Professor Shamim has demonstrated the requisite excellence in teaching, scholarly achievement, and service worthy of promotion to professor with tenure. I am pleased to recommend Tariq Shamim for promotion to Professor of Mechanical Engineering, with tenure, Department of Computer Science, Engineering, and Physics, College of Arts and Sciences.

Recommended by:



Susan Gano-Phillips, Dean
College of Arts and Sciences

Recommendation endorsed by:



Douglas G. Knerr
Vice Chancellor for Academic Affairs



Susan E. Borrego, Chancellor
University of Michigan-Flint

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