

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Mechanical Engineering

Chinedum E. Okwudire, 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:

Ph.D.	2009	University of British Columbia, Mechanical Engineering, Vancouver, BC
M.S.	2005	University of British Columbia, Mechanical Engineering, Vancouver, BC
B.S.	2003	Middle East Technical University, Mechanical Engineering, Ankara, Turkey

Professional Record:

2011-present	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2010-2011	Senior Mechanical Engineering, DTL Corporation, Davis, CA

Summary of Evaluation

Teaching: Professor Okwudire is an exceptional teacher and excellent advisor to our students. Since joining the University of Michigan, he has taught two core undergraduate courses (ME240 and ME350) and a graduate course (ME584) that was restructured and greatly improved by him. In addition, he has volunteered to teach the small section of ME240 (as part of the university's small class section initiative). One of his key goals for this small section was to investigate ways of improving the performance of struggling students. He applied for and won a 2015 CRLT Faculty Development Grant to develop Course Content Connectivity Resources that will benefit six core courses in the ME undergraduate curriculum. His teaching evaluations are consistently very high, with Q1/Q2 all above 4. Most of his Q1/Q2 scores are much higher than his Q4 score; showing he has been very successful in improving students' interest in learning even if they were not originally enthusiastic about the subject. The student letters are extremely positive, testifying that he is a caring, responsive, and effective teacher. He has supervised several undergraduate and M.S. student research projects and has graduated one Ph.D. student with another five in progress. Graduate students view him as an excellent advisor who is knowledgeable, thoughtful and supportive. His mentorship is well demonstrated through the many papers he has published with his students. His contributions have been recognized by his peers with the 2016 Ralph Teetor Educational Award from the Society of Automotive Engineers (SAE) and his invitation to speak at the 2014 Frontiers of Engineering Education Symposium of the National Academy of Engineering. The latter was to present his ideas on improving the mechanical engineering undergraduate curriculum through course content integration.

Research: Professor Okwudire has been building a great reputation in the technical areas of high-precision and sustainable manufacturing machines and mechatronics. His key contributions have been in exploiting fundamental knowledge from machine dynamics and control theory to develop new ways of designing and controlling manufacturing machines such that their positioning speed and precision are improved at reduced environmental (specifically, energy) and economic costs. He has developed a strong research program here, with a good mix of external research grants sponsored by NSF and Ford Motor Company. He publishes in quality refereed journals in his field, with 15 journal papers published or accepted since arriving here (many with his UM students). He has published 19 refereed conference papers and has four pending patents. He has also been active in presenting at important conferences in his field and has been invited to give talks at several peer schools. External reviewers are supportive of his case, praising his research quality, accomplishments and potential. He has developed an excellent research record with outstanding potential. He has received the NSF CAREER Award, the Young Innovator Award from the International Symposium on Flexible Automation, and the Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers.

Recent and Significant Publications:

- Lee, J., Ghasemi, A.H., Okwudire, C.E., Scruggs, J. "A Linear Feedback Control Framework for Optimally Locating Passive Vibration Isolators with Known Stiffness and Damping Parameters," *ASME Journal of Vibration and Acoustics*, in press, <http://dx.doi.org/10.1115/1.4034771>.
- Ramani, K., Duan, M., Okwudire, C.E., Ulsoy, A.G., (2016), "Tracking Control of LTI Nonminimum Phase Systems using Filtered Basis Functions." *ASME Journal of Dynamic Systems, Measurement and Control*, 139(1), 011001.
- Yoon, D., Okwudire, C.E., (2016), "Active Assist Device for Simultaneous Reduction of Heat and Vibration in Precision Scanning Stages," *Precision Engineering*, 46, 193-205.
- Okwudire, C., Ramani, K., Duan, M., (2016), "A Trajectory Optimization Method for Improved Tracking of Motion Commands using CNC Machines that Experience Unwanted Vibration," *CIRP Annals - Manufacturing Technology*, 65(1), 373-376.
- Lee, J., Okwudire, C.E., (2016), "Reduction of Vibrations of Passively-Isolated Ultra-Precision Manufacturing Machines using Mode Coupling," *Precision Engineering*, 43, 164-177.
- Duan, M., Okwudire, C.E., (2016), "Energy-Efficient Controller Design for a Redundantly Actuated Hybrid Feed With Application to Machining," *IEEE/ASME Transactions on Mechatronics*, 21(4), 1822-1834.
- Duan, M., Okwudire, C.E. (2016). "Minimum-time Cornering for CNC Machines using an Optimal Control Method with NURBS Parameterization." *International Journal of Advanced Manufacturing Technology*, 85(5), 1405-1418.
- Yoon, D., Okwudire, C.E., (2015), "Magnet Assisted Stage for Vibration and Heat Reduction in Wafer Scanning," *CIRP Annals - Manufacturing Technology*, 64(1), 381-384.
- Yang, S., Ghasemi, A.H., Lu, X., Okwudire, C.E., (2015), "Pre-compensation of Servo Contour Errors using a Model Predictive Control Framework," *International Journal of Machine Tools and Manufacture*, 98, 50-60.

Okwudire, C.E., Rodgers, J., (2013), "Design and Control of a Novel Hybrid Feed Drive for High Performance and Energy Efficient Machining," *CIRP - Manufacturing Technology*, 62(1), 391-394.

Service: Professor Okwudire has an overall record of service that has exceeded expectations for junior faculty members at this stage in their career. He is a great citizen at Michigan who takes service work seriously. He has been a member of his department's Seminar Committee, Graduate Admission Committee and Undergraduate Program Committee, and the College of Engineering Global Automotive and Manufacturing Engineering Program Committee. He has also led and coordinated the junior faculty mentoring luncheon for his department. Recently, he became co-chair of the Department of Mechanical Engineering Research, Innovation, Service, and Entrepreneurship (RISE) program and the Mechanical Engineering Undergraduate Symposium (MEUS) Program Committee. He has contributed significantly in promoting diversity and inclusion here through outreach to underrepresented minority (URM) groups at various levels. With a grant from the U-M ADVANCE 2016 Faculty Leading Change Program, he has created a study club and support group for URM undergraduate students in ME. He also volunteered to help the college in recruiting talented URM students at the National Society for Black Engineers Conference in March 2016. He has mentored students from two minority groups on Campus: the Society of Hispanic Professional Engineers (SHPE) and the Society for Minority Engineers and Scientists–Graduate Component (SMES-G), for an outreach initiative to URM middle school students in Detroit.

Professor Okwudire is a member of the American Society of Mechanical Engineers (ASME) Manufacturing Engineering Division, the ASME Dynamics Systems and Control Division Mechatronics Technical Committee, and the Control Systems Working Group of the American Society for Precision Engineering. He has co-chaired the 2014 Manufacturing Science and Engineering Conference/North American Manufacturing Research Conference (MSEC/NAMRC) (a major conference in the field of manufacturing) and a symposium in Mechatronics for Advanced Manufacturing. He has served on an NSF proposal review panel and as a referee for a wide variety of journals.

External Reviewers:

Reviewer A: "...I believe that Prof. Okwudire has a demonstrated record of highly-relevant innovations that substantially exceed those of his peers, and also expect that he will continue to grow and expand his influence throughout his career as simultaneously a highly-regarded researcher, an effective teacher, and a skilled machine designer with a strong industrial base of support."

Reviewer B: "There are many professors [of his cohort] studying kinematics and dynamics, but few bring theory and practice to the forefront. Dr. Okwudire is one of these rare individuals."

Reviewer C: "The quality of Dr. Okwudire's work is excellent. He has established a high quality research program that is addressing important engineering challenges in the design and control of precision mechatronics systems... Dr. Okwudire has established a core expertise in the area of precision mechatronic systems. His focus in this area is clearly impacting important industrial problems."

Reviewer D: “I have also read many of Dr. Okwudire’s papers, which are strong contributions in our field. On the basis of all these experiences I am very confident that Dr. Okwudire is an excellent professor [of his cohort] and researcher and should surely be promoted to the rank of Associate Professor with tenure.”

Reviewer E: “His work is distinguished by his ability to address important manufacturing issues through synergistic design of novel hardware combined with development of advanced control strategies to optimize the performance of that hardware. In my experience this is a fairly unique combination of skills, and undoubtedly accounts for his early success as a researcher.”

Summary of Recommendation: Professor Okwudire is a great asset. He is an exceptional teacher and excellent advisor. He has built a very strong research program here with outstanding potential, and has been publishing high-quality papers. He has been an excellent citizen in serving the university and the professional community, and has passionately initiated and participated in several programs to enhance diversity, equity and inclusion. It is with the support of the College of Engineering Executive Committee that I recommend Chinedum E. Okwudire for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.



Alec D. Gallimore, Ph.D.
Robert J. Vlastic Dean of Engineering
College of Engineering

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