Message from the Chair

First — many thanks to the CSU community for welcoming me to your university! It has been a little over a month since I became chair, and each day I’m struck by the quality of the department! Furthermore, it is with gratitude to all current and former faculty and students in Mechanical Engineering that I share this newsletter with you. Nothing gives me more pleasure than receiving photographs and updates from members of our community, each showcasing different aspects of Mechanical Engineering at Cleveland State University!

As Spring arrives, there is a definite “buzz” in the air! Faculty members are working with design teams (see pages 5 and 7) to excel at regional competitions, our SAE BAJA team continues to build on its impressive performance in 2018 (see page 11), and we are about to host the 2019 AIAA Region III conference (page 4).

In parallel with these events, we are also excited with the new Washkewicz Hall! We have state-of-the-art teaching and research facilities — not to mention the Dan T. Moore Maker Space — and are always willing to give tours to future students (or anyone wishing to engage with CSU’s Department of Mechanical Engineering)!

Feedback is always welcome!

Brian L. Davis, Ph.D
Chair, Mechanical Engineering
(B.L.Davis@csuohio.edu)

Upcoming Events

March 27: Grand Opening Reception for Phase II of Washkewicz Hall. Register at: https://csuengineering.formstack.com/forms/grand_opening

April 4: Order of the Engineer ceremony.
April 5-7: AIAA Region III Conference (see page 4)
April 11-12: Fluid Power Vehicle challenge (page 5)
April 20: SAE Fundraiser (Skyview Lodge in Brunswick, See page 11)
April 26: Senior Design presentations
May 3: Senior Design Symposium
Faculty Spotlight: Bogdan Kozul, Director of Motion Control Systems

Bogdan Kozul joined the Washkewicz College of Engineering as an assistant professor of practice in the Department of Mechanical Engineering for the 2018-19 academic year. He manages the Parker Hannifin Motion Control Laboratory for Fluid Power Systems in Washkewicz Hall. The lab seeks to provide students with the skills needed to innovate, design and build the motion control systems used in manufacturing, automation, aerospace, construction and marine applications.

Professor Kozul encourages students to work in teams and manage their design projects or conduct research on trending technologies in motion control applications. This experience reinforces engineering theory learned in the classroom and assists students in finding career opportunities that resonate with their intellectual curiosity. Industrial partners support students with design expertise along with the hardware, software and controls used by thousands of the leading engineering companies across the globe.

Professor Kozul was previously the group manager of technical training at Parker Hannifin. He started his career at BFGoodrich, where he supported engineering, operations and production of landing gear for military and commercial applications. He holds a BSME from Cleveland State University and an MBA from Case Western Reserve University.

Factoid: Over the past 12 months, three new Mechanical Engineering laboratories have been set up: (i) Parker Hannifin Motion and Control Lab, (ii) Center for Human Motion and Control Lab, and (iii) Thermal Fluid Teaching Lab!
Top Ten in the World for Toyota Mobility Challenge!

Congratulations to Professors Jerzy Sawicki (Mechanical Engineering) and Dan Simon (Electrical Engineering and Computer Science) for being among the top ten proposals in an international competition sponsored by the Toyota Mobility Foundation.

Dr. Sawicki and Dr. Simon are collaborating with Parker Hannifin to develop, design and commercialize a pediatric exoskeleton for children ages 6 to 11, which could assist individuals suffering from cerebral palsy as well as diseases such as spina bifida, myopathy, and neuropathy. The device would help thousands of individuals around the world learn to walk, while also providing essential data that could improve future treatment for children and adults with mobility issues.

Regional Meeting of the American Society of Biomechanics

Graduate students in the College of Engineering are always encouraged to attend professional meetings in their field of study. On February 28, five CSU graduate students travelled to Dayton to participate in the Midwest meeting of the American Society of Biomechanics. Their presentations covered gait biomechanics, rehabilitation and computer simulation (Table 1). Not only did they present their work, but they also had the opportunity moderate scientific sessions. Thanks go to the organizers and the American Society of Biomechanics!

(Above) Hala Osman, Jack Schultz, Huawei Wang and Brittany Sommers at the ASB meeting in Dayton

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<td>Quantifying the Effect of Exercise Interventions on Gait Instability in Post Stroke Population</td>
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<td>Christopher Schroek and Antonie J. van den Bogert</td>
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Spring AIAA Conference at CSU

2019 AIAA Region III Student Conference
5 - 7 April 2019
Location: Cleveland, Ohio
Venue: Cleveland State University

Open Invitation!

Cleveland State University’s student chapter of The American Institute of Aeronautics and Astronautics (AIAA) will host the Region III student conference this year. This is an opportunity for students from over 30 universities to present their research, network with peers, and engage with industry representatives and academics who help prepare the future aerospace workforce.

For this year’s event, attendees will have the opportunity of touring the NASA Glenn Research Center (GRC). Furthermore, we are delighted that the Deputy Director of NASA GRC, Dr. Perez-Davis will deliver a keynote address at the conference.

(Above) AIAA- CSU’s faculty advisor Dr. Wei Zhang with graduate student Jodi Turk, at last year’s AIAA conference. Jodi took second place in the individual graduate category for her research on “Interaction of a Real Seal Whisker with Surrounding Vortex: Vortex Shedding and Vortex Induced Vibration”.

For more information, see:
https://www.aiaa.org/2019-Region-III-Student-Conference/
or, contact the AIAA staff representative, Rachel Dowdy at racheld@aiaa.org.
Student Endeavor: Fluid Power Challenge

The National Fluid Power Association (NFPA) is sponsoring the Fluid Power Vehicle Challenge on April 11-12.

CSU has participated in the NFPA’s Fluid Power Vehicle Challenge for many years, with last year’s team placing second. This year’s team plans to bring home the gold with their innovative design this spring at the competition in Denver, Colorado.

The team set off to design a vehicle that would be easy to operate for all riders, while holding the weight of its hydraulic components. Moreover, the bike had to be optimized for the three races, (i) endurance, (ii) sprint, and (iii) efficiency.

To achieve this optimization the team reached out to numerous industry sponsors, with many being very willing to be a part of this year’s challenge. Lincoln Electric helped the CSU team make their custom tank design a reality by fabricating their custom design to conform to the shape of the bike, while reducing the overall envelope. In addition, Valencia Rucker from Parker Hannifin Corporation provided technical support in streamlining the fluid power components and connectors in a bid to improve the vehicle’s safety while reducing the bike’s weight.

(Above) The team is made up of a group of mechanical engineering students with a variety of skills needed to create a successful hydraulically powered vehicle. Left to right: Jen Wisniewski, Jason Downie, Matt Sokolich, Patrick McDonough, Sean Mulvin, and Markus Kotze.

Universities that will compete to see who can design the best fluid power bike

- Cleveland State University
- California Polytechnic State University at San Luis Obispo
- Colorado State University
- Iowa State University
- Kennesaw State University
- Montana State University
- Murray State University
- Purdue University
- University of Cincinnati
- University of Denver
- University of Utah
- University of Denver
- West Virginia University Institute of Technology
- Western Michigan University

(Left) Markus Kotze and Jason Downie working on their chainless bicycle.
Dr. Jason Halloran, an assistant professor in the Department of Mechanical Engineering and a co-director of the Center for Human Machine Systems (CHMS), has been awarded a research grant by Stryker, a Fortune 500 medical technology company. The one-year award for over $60000 will fund the development of proof-of-concept computational models of knee joints.

Dr. Halloran’s research focuses on computational biomechanics with applications in orthopedics-related device analysis, multiscale simulation of human tissue, and cellular deformation. He has collaborated with surgeons at St. Vincent Charity Medical Center’s Spine & Orthopedic Institute to improve rehabilitation techniques and create new prosthetic technologies. Dr. Halloran also serves as the faculty liaison to the Institutional Review Board (IRB), which is responsible for ensuring compliance with all federal and state regulations regarding human subjects.

In February this year, Dr. Halloran’s lab members travelled to the Orthopaedic Research Society’s annual conference in Austin. Their presentations included the following:

- Neda Abdollahi; William Zaylor; Bernard N. Stulberg; Jason P. Halloran: A Comparison of Recruitment Probability of Cruciate Ligaments During Distraction and Traditional Intact Loading.


- William Zaylor; Bernard N. Stulberg; Jason P. Halloran: Use of Novel Joint Loading to Estimate Knee Ligament Properties With Multiple Specimens

(Above) Doctoral student, Neda Abdollahi presented her research on knee ligament biomechanics in Austin, TX in February.
Winners at the 8th annual GLSC Design & Build competition

Students from the Washkewicz College of Engineering participated in the 8th annual Design & Build competition. This local event was held at the Great Lakes Science Center on February 9, 2019. It serves as a fundraiser for the Science Center’s many education programs and features teams from both local schools and companies.

Each team has to race against the clock and compete against other teams to design, build and test different solutions to the challenge. On the day of the competition, each team is greeted with a mystery box full of supplies and a challenge to design and build a vehicle that can precisely stop on different inclines. Each challenge is graded differently, thus requiring teams to develop unique strategies. The CSU team used a braking system that allowed their vehicle to roll past the low score zones, and then deploy a brake to stop on top of the hill worth the most points.

Special thanks go to Pete Buca from Parker Hannifin for sponsoring Washkewicz College of Engineering students and Dr. Rashidi for providing both leadership and inspiration to our students!

(Above) Patrick McDonough, Tyler Brininger, Ryan Snow and Justin George working on their vehicle.

(Above) Team members Sai Kiran Gunti, Patrick McDonough, Ryan Snow, Justin George, Tyler Brininger, and Rowan Myatt at the Great Lakes Science Center.
2019 North East Science and Engineering Fair

On February 12, over 450 students from Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties attended the 66th North East Ohio Science and Engineering Fair. This is an annual event that features multiple categories, including physics, health/medicine, environmental science, math and chemistry. About 10% of the projects were in the Engineering category, which resulted in keen competition for the top three CSU engineering awards!

(Above) MCE student, Justin George, speaks with Daniel Ecker from Hawken Upper School presented his work on the construction of a “Morbidostat” system.

(Left) Two projects from 7th/8th graders: (i) Dmitry Lipert studied the impact of air intake on engine power, and (ii) Anna Lisac examined the protective qualities of new hockey helmets.

(Above) Recipients of the CSU Engineering Awards were: (i) Garrett Blum from University School for his project on using neural networks for predicting shock attenuation in honeycomb structures, (ii) Audrey Zorman from Beaumont, for her project on wearable electronics, and (iii) Charles Pafford from Incarnate Word Academy for his project on optimizing fused deposition approaches for components used in vehicle suspension.

The Northeastern Ohio Science and Engineering Fair
Partnership with Beachwood High School

The Beachwood City Schools, in partnership with Cleveland State University’s Washkewicz College of Engineering, offer a rigorous Design & Innovation program with a 4-year pathway for high school students interested in design and/or engineering. Students in this program are exposed to the design process including research and analysis. They engage in project-oriented learning that enhances teamwork, communication, and encourages an understanding of the individual and global impact of design decisions. Students learn how to use the latest technology tools, such as Solidworks software, laser cutters, 3-D printers, and CNC machines.

Working closely with Professor Majid Rashidi, Mr. Chris Croftcheck, Beachwood High School teacher and CSU adjunct professor, provides students experiences in a range of engineering disciplines through varying themed projects, guest engineering speakers as well as field trips to engineering universities and private industry facilities.

To further students’ experiences and opportunities within this partnership, the Washkewicz College of Engineering and the Beachwood City Schools now offer Cleveland State University credit for students in the Design & Innovation Program through the College Credit Plus program.

(Above) Beachwood students working on using computer-aided design to create prototypes that can then be tested. L-R: Ehima Ogor, Andrew Steckner and Shivani Rajgopal.

(Above) Dr. Majid Rashidi, a senior faculty member in Mechanical Engineering and on the Management Team of the Fenn Academy.

For more information on joining the Fenn Academy, see: https://www.csuohio.edu/engineering/fennacademy/benefits-membership
Graduate Tracks in Mechanical Engineering

The mechanical engineering graduate program prepares students for a variety of technical and professional fields. Graduates of the program may use their educational background as preparation for a career in research and development, academia or industry — in any of four tracks shown on the right.

For information on the graduate program, including the option of the 4+1 sequence that allows undergraduate students to further obtain a Masters degree, see: 
https://www.csuohio.edu/engineering/mce/mce-graduate-students

(Above and right) Examples of opportunities for graduate student research in mechanical engineering at CSU.

(Left) Poya Khalaf at his doctoral defense “Design, Control, and Optimization of Robots with Advanced Energy Regenerative Drive Systems ”. During his final semester, Poya also had the opportunity of teaching a course on Measurements.

The MCE department wishes Poya all the best as he embarks on the next stage of his career, working for Intuitive Surgical in California!
CSU Welcomes Visiting Scholar from Korea

During the fall of 2018, CSU was fortunate to host Dr. Byoung-Ho Kim from Kyungsung University. Dr. Kim is from the Department of Mechatronics Engineering in Busan, Republic of Korea.

Dr. Kim was drawn to CSU because of Dr. Hanz Richter’s reputation in the area of control systems, specifically in terms of a framework for effective control of robotic mechanisms. Dr. Kim’s work was to expand upon this framework and identify fundamental issues in the field of prosthetic leg mechanisms that can assist transfemoral amputees.

According to Dr. Kim, the highlight of his research at CSU was “To reveal practical advantages of an energy regeneration-based hybrid control approach for transfemoral prosthetic legs”.

While in the USA, Dr. Kim had the opportunity of presenting his research with Dr. Richter at the 44th Annual Conference of the IEEE meeting held in Washington D.C. (October, 2018). Their paper was “Energy Regeneration-Based Hybrid Control for Transfemoral Prosthetic Legs Using Four-Bar Mechanism.”

Dr. Kim: Thank you for spending time at CSU!

Looking for Sponsors! Contact: csuohiosae@gmail.com

(Above) CSU’s Society of Automotive Engineers needs sponsorship to go to BAJA SAE tournaments! These events challenge engineering students to design and build an off-road vehicle that can survive severe punishment in the form of many tests on rough terrain. Students must function as a team to not only design, build, and race a vehicle within a set of rules, but to also generate financial support for their project. On the right, CSU’s Justin George competes against a driver from Universite Du Quebec at Rimouski.
Out and About

(Right) Dean Karlsson thanking Dr. Ton van den Bogert for serving as Interim Chair of Mechanical Engineering. Dr. van den Bogert served for a year in this capacity, overseeing new faculty hires and the expansion into the new Washkewicz Building.

(Below left) Faculty member, Dr. Wei Zhang speaking with Bryan Palaszewski from NASA’s Turbomachinery and Propulsion Systems Division. They were at the Cleveland Museum of Natural History’s “Solution Evolution” event.

(Above) Jacqueline Foradora, Milan Mlinac, Justin Daher and Naik Yusufi at a College of Engineering welcome event.

(Left) Matthew Johnson, Director of the Maker Space, giving a tour to Sam Eisler, a 4+1 student in Mechanical Engineering.

(Far left): Mechanical Engineering students, Morgan Gleason and Beth Kline at their welcome booth during Engineers’ Week.

(Left) MCE graduate student, Derek Wolf, volunteering at a “Replay for Kids” event where toys were being modified for children with musculoskeletal limitations.