ME Bulletin

News for Mechanical Engineering Majors

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PHOTO PROVIDED BY JACOB GRECA

Jackson Rayer, ME senior, poses for a picture next to the MSU Baja vehicle. Read about Baja SAE on page 8.

Do Mechanical Engineers need to learn how to program?

By Dr. Recktenwald, Undergraduate Associate Chair

Students often ask, "Why do mechanical engineers need to learn how to program?" This is a great question and the answer has three key parts.

***First**, programming trains mechanical engineers in systematic, clear, problem solving.*

Programming is difficult because computers do exactly what you tell them to do and nothing more. Learning how to make a computer complete a task is an exercise in taking a complex problem and breaking it down into very specific logic-based tasks. Humans are great at inferring meaning, determining intent, and filling in gaps in instructions. Computers don't think like humans and because of this limitation they mercilessly point out where our instructions are incomplete or unclear. This can be frustrating, but working through the details of writing a program helps engineers develop the ability to be precise, logical, and specific in their work.

Learning to write computer code requires thinking ahead. I'll never forget the first time I needed to write a computer program that was too large and complicated to fit in my head at one time. I got out a pencil and paper and outlined the problem using block diagrams starting with general code objectives. Each block in a diagram was fleshed out with its own set of block diagrams with more detailed objectives. This continued until I was confident I could code each piece of the program. Computer programming, done right, requires engineers to carefully organize their problem-solving process. Because many computer codes take inputs and return outputs, writing code asks us to carefully specify what data are needed and what output is important. As a mechanical engineer, scaffolding a complex problem is one of the more useful skills I have developed, and mastered it by learning how to properly write computer code.

Perhaps the most vexing part of programming is troubleshooting. We spend hours writing a code only to have it not work. Then we spend twice as long combing through the code to find our bugs. What a waste of time! Actually, troubleshooting is a key piece of mechanical engineering. Designs never work properly the first time. Manufacturing processes need to be tweaked and refined so they consistently produce highly accurate and precise parts. Experiments go wrong and data measurement devices need troubleshooting. As a mechanical engineer you will spend much of your time troubleshooting. While you may not be troubleshooting code, the skills you develop when learning to program are the same ones you will use to troubleshoot mechanical systems: carefully reviewing each line of code or component of a mechanical system, creating tests to make sure that piece is working properly, and creating more tests to make sure two pieces are working together correctly. These are imperative skills for any mechanical engineer. As a side note, laboratory classes are similar in this regard. Even though it can be frustrating to have to troubleshoot an experiment, it is one of the most valuable learning experiences you will have in college.

***Second**, programming provides mechanical engineers with a base level foundation for understanding computational tools.*

The engineering challenges of the 21st century are complex and interdisciplinary. Fortunately, the tools we are developing are increasingly powerful. Computational tools like

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ME Bulletin

The *ME Bulletin* is published twice a year (fall & spring) for sophomores, juniors, seniors, faculty, and staff of the Department of Mechanical Engineering. Photographs were taken by Craig Gunn unless noted otherwise.

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In This Issue

Department News

PHOTO FROM GEORGIA TECH WEBSITE

Dr. Minami Yoda joined the ME Department as chairperson this fall. She comes to us from the G.W. Woodruff School of Mechanical Engineering at Georgia Tech where she was a Ring Family Professor.

She is a former chair of the American Physical Society Division (APS) of Fluid Dynamics and former chair of the American Nuclear Society Fusion Energy Division and an editor of *Fluid Dynamics Research* and an associate editor of *Experiments in Fluids*. She was elected a Fellow of the APS in 2012 and the American Society of Mechanical Engineers in 2008.

Her research interests in experimental fluid mechanics and optical diagnostics are focused on colloidal dynamics, flow boiling of dielectric fluids, super-resolution microscopy, and the thermal-fluids performance of plasma-facing components for magnetic fusion energy. The goal of her work in nanofluidic diagnostic techniques is to optimize liquid transport at the submicron scale, a critical technology for the next generation of biochemical microsensors.

Dr. Yoda was a postdoctoral researcher at the Technical University of Berlin in Germany and a visiting researcher at the Delft University of Technology in the Netherlands. Her undergraduate studies were at the California Institute of Technology. She received master's and Ph.D. degrees at Stanford University.

Curriculum News

Co-op Students: Before you leave for your Spring 2024 co-op rotation, be sure to discuss your schedule for next Summer and Fall 2024 with your academic advisor.

ME 451-Control Systems & ME 481–ME Design Projects require *department approval* before you can enroll. If you have an accurate long-term schedule on file wih either **Jeffrey Tsang** or **Gaile Griffore**, request approval by submitting the following forms:

•ME 451-
https://me.msu.edu/me-451-enrollment-approval-form

•ME 481-
https://www.egr.msu.edu/me/me481-approval-form

▶*If you do not have an accurate long-term schedule on file, schedule an appointment with your acaademic advisor by going to student.msu.edu.*

ME 456-Mechatronics has been added to the official list of design intensive senior electives. It has also been added to the list of options on the Aerospace Concentration.

ME 465-Computer Aided Optimal Design has been canceled for Spring 2024. Students who are completing the Computational Design concentration can substitute either ME 456 or ECE 448.

Class Standing. ME juniors and seniors can obtain this information by emailing their academic advisor:

•Jeffrey Tsang (Last Name A-K):
tsang@egr.msu.edu

•Gaile Griffore (Last Name L-Z):
griffore@egr.msu.edu)

Be sure to use your MSU email address.

Job Search Advice: The Center is available to answer questions about your job search. To ask a question or schedule an appointment, go to:
https://www.careers.egr.msu.edu/

Prerequisites: The ME department expects all students, *including members of the Honors College*, to observe all course prerequisite requirements. If you have a question about prerequisites, contact your academic advisor.

Academic Advising

Margo Glew advises ME sophomores whose last names begin with L-Z.

Jeffrey Tsang advises ME sophomores, juniors, and seniors whose last names begin with A-K.

Gaile Griffore advises ME juniors and seniors whose last names begin with L-Z.

▶***To schedule an appointment with your advisor, go to student.msu.edu***

Tutoring

•**The ME Learning Center** (https://me.msu.edu/me-learning-center)has free mentors for ME 201, 222, and 361. It is open at 6-10 p.m. on Sunday through Thursday.

•**Paid Undergraduate Tutors** are available for many ME courses. Students in need of tutoring help for a particular course are matched with fellow students who have performed well in that course. Payment is negotiated privately between the tutor and the student within appropriate limits. For help go to:
https://sites.google.com/view/msu-tbp-pts-tutoring-database/home

Teaching Award Nomination Form:

ME Juniors & Seniors Select Dr. Anthony for the 2023 Withrow Teaching Excellence Award!

Professor Anthony received the 2023 Withrow Teaching Excellence Award last spring at a special awards dinner and ceremony. She was presented with an inscribed plaque, a medallion, and a small stipend. Each year a committee consisting of student representatives from ASME and Pi Tau Sigma reviews nominations from ME juniors and seniors and makes the selection.

HARLEY SEELEY

Dr.Leo Kempel, Dean of the College of Engineering, presents Dr. Anthony with the 2023 Withrow Teaching Excellence Award.

Dr. Rebecca Anthony grew up in Maryland and attended Carleton College in Minnesota, where she majored in physics. She received her Ph.D. in mechanical engineering from the University of Minnesota in 2011, and after that she stayed at UMN to do post-doctoral research on the diagnostics of dusty plasmas.

Her research interests include plasmas for synthesis of semiconductor nanostructures, gas-phase processing and functionalization of nanostructures, and aerosol deposition of functional films. The applications for these nanostructures and materials range from energy-oriented devices like light-emitting diodes and solar cells to biological imaging agents.

Dr. Anthony is described as a professor who is "welcoming, optimistic, and friendly - and a person who takes the time to check on the wellbeing of her students."

Her classes, while focusing on engineering issues, move beyond the topics and generate community in the assembled group. Students describe her ability to make personal engagement an integral part of the educational process.

One student remarked: "I felt as though I was learning from a person and not a screen." For students who were transferring to MSU (especially into an online environment), she has given them the support needed to make the leap to a new level of academia. Transfer students have remarked that they could not have asked for a better first impression of the mechanical engineering program.

Another nominator noted: Covid created many problems for students and faculty alike, but Anthony always cared. The mental health of her students was at the forefront of her dedication to their learning. For these reasons and many more, she is a worthy recipient of this award.

Dr. Anthony lives in Lansing with her husband and two kids (10 and 5). She enjoys outdoor activities such as hiking, running, and cross-country skiing, as well as printmaking and baking. Dr. Anthony was motivated to study engineering as a way to contribute to the world's transition from fossil fuels to renewable energy, and paired that with her interest in nanomaterials to arrive at her current research area. She is teaching ME 201 this semester.

Nominate

a professor for the 2024 Withrow Teaching Excellence Award!

Deadline: Wednesday, Nov. 8

To access the Nomination Form:

1) Go to the ME Website:

https://www.egr.msu.edu/me/

2) Click on Undergraduate

3) Click on Forms and Policies

4) Select Withrow Nomination

THANKS!

The Fifty Thousand Dollar Question: Are You Creative? by Craig Gunn, Director of Communications

I am not sure how many years ago I listened to young starting engineers talking about their technical process and how creativity meant nothing. In thinking about that idea, someone may have told you, or tweeted, or put on your Facebook page that you are an engineer and therefore you are NOT creative. Some misinformed character may have lumped you into a black box filled with technical terms, equations, and random figures and tables and relinquished your life to a fathomless depth of uncreativity. Well, it is time to set the record straight and respond to that indictment. Are you CREATIVE?

This is kind of a foolish question and the answer is YES! No matter how hard you try to remove yourself from the juices that flow beyond the technical, one of the most important parts of your existence is how you approach your own creativity. Think about all the designs that have hit the market in the last 100 years or go back a further 1000 years. New car designs, cellphones, games, boats, you name it and there is an enormous amount of creativity involved. Yes, the technical aspects are vastly important in the design of the specific item, but it is the creativity that is shown in that design that makes or breaks the acceptance of it. And who provides that creativity? Obviously, you and your fellow engineers do!

Engineers as a group are some of the most creative people on the planet. You think out of the box to come up with designs that will wow the public. You are constantly on the forefront of making something out of nothing and getting the public to buy in mass.

When you start to think that creativity is not just writing a novel, painting a picture, or putting words together to form a poem, you will understand the power of the creative engineer and use your technical knowledge and your inner creativity to give the world what it both needs and wants.

92 Seniors to Graduate in December!

Congratulations to all mechanical engineering December graduates! On behalf of the ME faculty, I wish you the greatest happiness and success in your careers, graduate studies, and personal lives. The following students had applied for graduation by October 13. If your name is missing, please contact me immediately (Email Gaile at <griffore@egr.msu.edu> Tele: 517-355-3338).

▶*The Commencement Office now requires candidates to register to participate in the ceremony. Here is the link: https://commencement.msu.edu/graduate-information*

Yusuf Abbas
Omran Alawadhi
Faisal Alsuhaimi
Hunter Arnett
Alexander Arnold
Jordan Arnold
Nick Aseritis
Graham Bailey
Longfei Bao
Abel Barraza
Cody Bartos
Josh Bennett
Nico Boehlert-Somohano
Ryan Bolio
Jacob Bruck
Chenghan Cai
Kylie Carbary
Alexander Choma
Waabe Damboba
Haley Denton
Jonathon Dufresne
Michael Dufresne
Lochlann Dunlavey
Tommy Erickson
Jack Feistritzer
Alex Figa
Brendan Foster
Matt Fular
Owen Garber
Brandon Gonzalez
Muad Hassan
Kailey Head
Josh Heibeck
Jericho Herblet
Nolan Hoffman
Emily Holman
Luke Honer
Matthew Jasgur
Philip Jeon
Wil Jozwiak
Henry Kantzes
Amjid Khogali-Watson
Citizen Kim
Jalen King
Deaven Kirn
Nathan Kowalski
Joe Lambert
Luke Lemont
Jonathon Lewis
Jason Li
Erik Liu
Dexter Lynch
Zach Maccoux
Bhanu Makkapati
Garrett Martin
Aaron McDowell
Anirudh Menon
Charles Mercer
Nicholas Michaels
Dan Mo
Raed Mohammed
Anthony Montemayor
Marianna Osentoski
Adam Peckens
Angel Perez
Zack Peterson
Thaz Rahman
Alex Rodriguez
Logan Roeser-Nordling
Luke Roethemeyer
Celeste Salazar
John Salloum
Luke Schmidt
Noah Schott
Courtney Smith
Arron Stebic
Adam Stevens
Nic Stoller
Aidan Svoboda
Alejandro Tlatelpa
Brandon Tsivitse
David Twomley
Saketh Vaka
Tate Virkus
Sarah Walrath
Jack Whitcomb
Nathan Wright
Yang Yi
Alex York
Lesheng Zeng
Richmond Zhang
Lingyi Zhao

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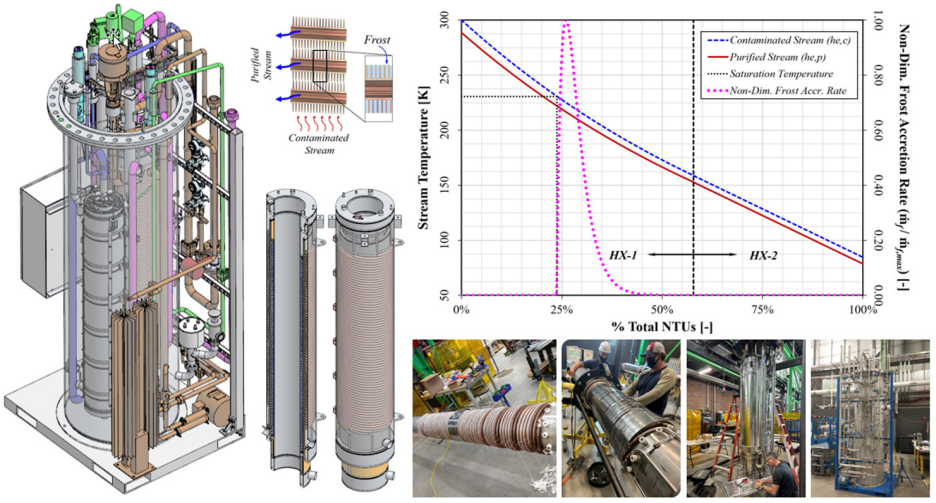
Low-level Purification of Helium for Cryogenic Applications

by Dr. Nusair M. Hasan

Process gas purifiers are an essential sub-system for large-scale cryogenic helium refrigerators, such as those used at the Facility for Rare Isotope Beams (FRIB) at MSU. At the very low operating temperature (typically 4.5 K or below) of these refrigerators, any impurities present in the refrigerant fluid (helium) will solidify. Even trace amounts of these impurities in the refrigerant can block and/or change the flow distribution in the process heat exchangers and potentially damage rotating equipment (e.g., turbo-expanders, centrifugal compressors / circulators etc.) operating at high speeds. Helium purifiers for cryogenic refrigerators are typically designed for a low level, i.e., less than 100 ppmv of impurity (typically moisture and constituents of air) removal. However, effective removal of the low-level moisture contaminant is challenging with adsorption-based purifiers, since the adsorbent (typically, molecular sieve) tend to lose its capacity over time and require a meticulous regeneration process. Freeze-out purification is a very effective method for removing low level moisture contamination due to the exponential behavior of the saturated vapor pressure with temperature. But this process requires careful process and mechanical design of a freeze-out heat exchanger to allow high thermal effectiveness with sustained frost formation.

The researchers at MSU Cryogenics Initiative with support from FRIB Cryogenics department staff have designed and fabricated a prototype freeze-out purification system for helium. This design employs a coiled finned-tube heat exchanger (also known as Collins heat exchanger) for the freeze-out of moisture and a liquid nitrogen cooled adsorption bed for the removal of the other major constituents of air (e.g. nitrogen, oxygen). When designed properly, the coiled finned-tube heat exchanger can offer a large surface area while maintaining



GRAPHIC PROVIDED BY DR. HASAN

Freeze-out purification system with heat exchangers designed by MSU Cryogenics Initiative and FRIB (left), estimated contamination (frost) freeze-out profile along the purifier heat exchanger (top right) and fabrication of the purification system (bottom right).

geometrical compactness, and providing good moisture accumulation capacity and mechanical robustness for contaminant freeze-out in the flow channels. The prototype purification system is estimated to increase the moisture collection capacity by 3-5 times as compared to the conventional, commercially available designs and significantly reduce the helium losses associated with the regeneration process and make the purification process more efficient. It is expected to be commissioned in the coming months. ME graduate students working with the MSU Cryogenic Initiative have developed predictive models to estimate the moisture collection capacity of this purification system (see figure above). The prototype purification system is equipped with adequate instrumentation, and extensive performance testing will be carried out to validate and improve these predictive models.

The MSU Cryogenic Initiative (https://frib.msu.edu/science/ase/cryogenic/index.html) is a collaboration between FRIB and MSU's College of Engineering. It offers opportunities for graduate students interested in applied research in cryogenic engineering and development of cryogenic systems / sub-systems such as the freeze-out purification system discussed above. It aims to educate and train future cryogenic engineers and system innovators. Three cryogenic engineering courses are offered to introduce UG and graduate students to various aspects of the field. These are:

- ME-413-Cryogenic Thermal Systems
- ME 414-Mechanical Design of Cryogenic Systems
- ME 940-Cryogenic Process Engineering.

For further information, please contact **Dr. Venkatarao Ganni** (ganni@frib.msu.edu), or **Dr. Nusair M. Hasan** (hasann@frib.msu.edu).

Dean's List

Congratulations to these 531 ME majors who made the Dean's List after Spring and Summer 2023. To be on the Dean's List, you must have a semester GPA of 3.5 or better. This list is from September 25. For updates, go to: http://www.reg.msu.edu/ROInfo/GradHonor/DeansList.aspx

SPRING 2023: Ahmed Abboushi, Mihir Abhyankar, Aanshuman Agarwal, Zahin Ahmed, Matthew Ajlouny, Batu Akgun, Elizabeth Aksovski, Elia Al Abdullatif, Zaid Almodhi, Shahd Alnasser, Qasem Alobaydan, Mohammad Alqaryouti, Faisal Alsuhaimi, Luke Aman, Lorenzo Amicucci, Xiaoqiu An, Connor Anderson, John Andres, Paxton Angliss, Ben Arkles, Kenneth Armor, Hunter Arnett, Jordan Arnold, Jenni Aubin, Sofia Aultman, Ethan Avery, Graham Bailey, Abel Barraza, Odrey Barreto Ramirez, Rodney Barrow, Carter Beck, Dominic Bednar, Jack Beison, David Benkes-Toth, Josh Bennett, Devin Bentley, Parker Bentley, Josh Bergdolt, Joshua Bishel, Sean Blanchard, Ashley Bolt, Colin Boulard, Ari Bozann, Lincoln Brecheisen, Luke Briggs, Samantha Brown, Thomas Burgess, Ian Burke, Blake Burns, Brittany Bush, Sydney Bush, Bashhar Byrouthy, Alessandro Cabrera, Chenghan Cai, Ian Calandrino, Beth Caldwell, Faith Call, Joey Campbell, Kylie Carbary, Jillian Carosella, Daniel Carrillo-Solis, Mitchell Carroll, Connor Casey, Jacob Casey, Alayna Celestini, Vimbainashe Chado, Carson Chao, Adam Charboneau, Dylan Chaudhry, Panzer Che, Sibo Chen, Max Cheng, Alexander Choma, Nicholas Chrisekos, Isabelle Christensen, Erin Chynoweth, Jenna Clark, Owen Cleary, Zachary Colo, Tea Comai, Amelia Conatser, Liam Cooney, Steven Coscino, Nicholas Coubard, Cole Cousino, Austin Crawford, Hannah Crist, Augusto Cucala, Andrew Culver, Ryan-Cristofer Curamen, Colson Currie, Alaina D'Allura, Julio Dam Ferdinez, Andrew Damboiu, Drew Darin, Ethan Darnall, Noureldin Darrag, Jack Darrow, Anthony Davis, Daniel Davis, Ross Davis, Matthew DeBona, Benjamin Deininger, Ben Delduca, Erin Denby, Haley Denton, Ryan DePree, Robert Dessy, Kathleen Dewan, Vidur Dhanapune, Jackie Dinh, Brendan Doane, Dalton Dobyns, Nick Dodge, Ian Doherty, Duncan Donley, Max Doty, Eric Douglas, Nathan Downie, Joe Dreon, Benjamin Drucker, Julian D'Souza, Jonathon Dufresne, Michael Dufresne, Joe Dumais, Van Duong, Saleem El Idrissi, Jonathan Elias, Tommy Erickson, Mitchell Essenmacher, Luke Etheridge, Ashton Farber, Kaitlyn Farner, Megan Fazio, William Fiedler, Scott Fingeroth, Benjamin Finkbeiner, Ryan Fitzgerald, Andrew Flight, James Fordyce, Brendan Foster, Chad Fowler, Adam Fox, Kage Fox-Sanchez, Joshua France, Rigdon Freker, Jonathon Fudala, Matt Fular, Joey Furuya, William Gaal, Kimberly Gerard, Nicole Gibbons, Christian Giggy, Thomas Gilbert, Jake Gilman, Noah Gilman, Ryan Gioffreda, Jack Girling, Stephanie Glaspie, Eric Glodich, Aman Goenka, Jordan Goik, Noah Goldman, Brandon Gonzalez, Erik Gonzalez-Zamora, Alex Goolsby, Kenneth Gordon, Elizabeth Grant, Joseph Griffin, Dylan Gumbinger, Krish Gupta, Sohan Gupta, Madden Hall, Abdallah Hamad, Ahmed Hamadah, Joe Hamouda, Evan Hampel, William Hanenkamp, M Haq, Ryan Harth, Edmond Hashem, Kaitlyn Heffelbower, Kayden Hellmann, Liam Herbert, Andrew Hilbert, Vaibhav Himthani,Bryant Hixson, Joshua Hoffman, Aaron Hopson, Henry Horak, Sepehr Hosseinkhani, Nolan Houghteling, Dylan Huck, Jacob Huskin, Soham Inamdar, Alexandra Iorga, Noah Iung, Logan Jacobson, Sandhya Jagannathan, Rathin Jaikol, Emilia Jakuc, Nathan Jansen, Christian Jaraczewski, Jake Jaskulka, Amanda Jeffers, Cole Jeffery, Wenhao Jin, Dylan Jones, Eric Joseph, Maxwell Joyce, Wil Jozwiak, Michael Kahl, Ashok Kamma, Yun Kang, Luke Karam, Joey Karr, Jacob Keegan, Kurt Kehren, Jacob Keller, Kylie Keller, Hailey Kelley, Sydney Kelly, Reese Kent, Egemen Keskin, Shahab Khorasanizadeh, Citizen Kim, Dahye Kim, Edward Kim, Renee Kinsler, Carson Kipp, Antonina Klatka, Hannah Kleid, Jeremy Kloss, David Knapp, Ryan Knight, Andrew Koch, Jack Konitsney, Ana Konjevic, Lizzie Kooistra, Colin Koot, Owen Korff, Keerthi Kothapally, Joe Kouchoukos, Ethan Krahe, Daniel Krahn, Elan Krakoff, Aidan Krambeck, Nathan Kramer, Zach Kranstz, Sache Krishnaraj, Ella Kruschka, Kennedy Kullman, Kylie Kuskowski, Chak Kwok, Ethan Labelle, Ian Ladd, Ava Lam, Joseph Lamberg, Wyatt Lamp, Zachary Lang, Nicholas Lauinger, Letizia Laura, Knick Laux, Alex Le, Maggie Le, Marin Leboucher, Douglas LeMasters, Ben Lemke, Luke Lemont, David Levasseur, Ali Lewis, Jonathon Lewis, Sean Lickfold, Elizabeth Ligi, Emily Ligi, Sumin Lim, Derrick Lin, Seth Lindsey, Matthew Lipscomb, Adolfo Lopez, Alessandro LoRe, Alexander Luerssen, Eric Luo, Cole Lutkenhoff, Matthew Luxhoj, Emma Luzbetak, Conor Lyle, Olivia Lyle, Robin Lynskey, Zixun Lyu, Josh Machuca-Gonzalez, Connor Mackenzie, Cole Mahaffy, Krithika Mahesh, Aria Mahinfallah, Lucas Maier, Bhanu Makkapati, Nicholas Malcolm, Nathaniel Malt, Nicholas Mansch, Adam Martin, Ryan Marvar, Kevin Mathews, Carter Mayer, Nick McCarthy, Damon McConnell, Olivia McCurdy, Nathan McDonald, Meghan McGill, John McGivern, Charlie Meilinger, Eden Melamed, Anirudh Menon, Nick Mercer, Anthony Merino, Zachary Merritt, Jackson Messer, Abbey Michaels, Alex Miciuda, Elliott Miller, Evan Misajlovski, Ashwin Misra, Jash Modi, Ravi Mody, Raed Mohammed, Bella Molnar, Anthony Montemayor, Kelly Montgomery, Luka Moriarty, Stephen Moussiaux, Noah Moyer, David Mueller, Emma Munro, Raul Murillo Martinez, Ethan Naas, Pyo Namkoong, Nikhil Narayana, Nicholas Nastovski, Luke Naughton, Ryan Nehls, Hannah Nelson, Joe Nelson, Riley Newell, Ethan Newman, Minh Nguyen, Nitin Niranjan, Tyler Noel, Collin Norder, Savannah Nseir, Peter Olszewski, Ava O'Neil, Aliza Opolka, Brady O'Shea, Enzo Ouriques Magalhaes, Luke Padron, Christopher Paige, Tyler Paparella, Graham Parent, Nicholas Pascual, Anita Patel, Anjali Patel, Arjun Patel, Khush Patel, Vedi Patel, James Patterson, Jon Paul, Rachel Paul, Calvin Pawlak, Ryan Pawlowski, Brandon Payne, Ricardo Paz Weber, Miles Peters, Evan Petersen, Emily Peterson, Matt Phelan, Nathan Phelps, Jordan Piatek, Joshua Picciano, Austin Pier, Ederick Plantegenest, Avery Powell, Matthew Price, Kaniz Promee, Leonardo Provenzola, Garrett Puehler, Keethan Punniyamoorthy, Sara Purdue, Abhirup Pusty, Ryan Qualley, Zoe Quinn, Kurt Rademacher, Ayaan Rajabali, Sai Rajaraman, Quinn Raleigh, Rishi Rao, Vinay Rao, Grace Reeber, Lily Reinke, Liam Rich, Monica Roberts, Noah Rockensuess, Logan Roeser-Nordling, Luke Roethemeyer, Nick Rogowski, Sam Rohrer, Kyle Roland, Ben Roraff, Brandon Roux, Noah Roux, Emilio Ruma, Jacob Rupprecht, Evan Rushbrook, Jake Rutkowski, Uriel Salinas, Jack Salisbury, Jason Sandberg, Gina Sapiano, Nicholas Sarver, Zachary Sawin, Gus Scheier, Justin Schmitz, Sam Schroeder, Tom Seaman, Veronica Sellin, Salvador Serna, Grace Sharon, Luke Shehigian, Noah Shephard, David Shim, Kody Simmons, Parth Singh, Luke Skonning, Alexander Smith, Cade Smith, Corey Smith, Tobias Smith, Wiley Smith, Skye Snyder, Antonio Sobczak, Aida Soltanian, Jihoon Song, Sujal Soni, Noah Sosnowski, Macy Spevacek, Lauren Spott, Hanna Stabler, Jacob Stabler, Brody Stack, Will Stamatakos, Jake Stanesa, Hunter Staton, Arron Stebic, Adam Stevens, Norman Stokes, Brock Strebeck, Michael Strong, Haosen Sun, Aidan Svoboda, Aditya Swarnkar, Kaden Swierkos, Alex Szumko, Andrew Tabaka, Larissa Tacaoca Honda, Austin Tait, Stephen Tamboer, James Tanay, Aditya Tarle, Neil Tegui, Emma Telepo, Nathan Tessmer, Adriana Theule, Kai Thin, Kaden Thompson, Michael Tippy, Alejandro Tlatelpa, Nicholas Todorov, Paddy Toole, Connor Trask, Cole Treece, Gus Tsalas, Jack Turner, Ryleigh Turner, David Twomley, Justin Tyack, Kevin Upcott, Manuel Vallejo Munoz, Val Vargas, Wade Varney, Kieran Velasquez, Tate Virkus, Emerson Voss, Mohammad Waleed Bin Munir, Deyuan Wang, Angela Wegrecki, Ethan Weisblatt, Sophie Weitzel, Charles Wejroch, Logan Wells, Connor Whitaker, Jack Whitcomb, Poom Wichitrakanlikit, Austin Wick, Jeremiah Wilkins, Paul Williamson, Owen Wilson, Andrew Wirth, Ethan Wise, Judson Wise, Aiden Wishart, Connor Witham, Kate Workman, Nathan Wright, Abbey Yager, Qiaochu Yang, Yoshid Showgo, Connor Youngerman, Kenny Yue, Nathan Zavsza, Haohua Zhang, Richmond Zhang, Zihan Zhang, Isaac Zondag, Nicholas Zuo, Brendan Zwiernik.

SUMMER 2023: Tommy McGowan, Saransh Mehta, Raed Mohammed, Courtney Smith, Gabriel Lipps, Emilio Ruma.

SAE International

COVER STORY

Baja SAE

MSU Baja represents MSU at Baja SAE competitions across the country where we compete with 60-80 other teams from around the world to design, build, and compete with the best off-road vehicle. This year we are returning from a successful season finishing 20th overall in Oshkosh and 13th overall in Ohio. We were able to score 5th place in the grueling suspension and traction course in Ohio and secure a 3rd place finish in the 4 hour endurance race - MSU Baja's first endurance podium finish in over 40 years! Highlights from the endurance race include holding off some of the traditional competition winners such as UofM and Cornell.

Last year our team poured thousands of hours of engineering design and precision manufacturing into our vehicle and the results really showed during the competition. We demonstrated a high level of reliability that allowed us to drive by our competitors as they pitted their own vehicles for repairs.

This year, as we begin the design and manufacturing of our new vehicle, we plan on continuing the upwards trend that we are on and improving our overall standings to become a top 10 team overall. *Submitted by Jacob Greca, Project Manager.*

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Formula SAE

Michigan State University's Formula Racing Team is revving up for an electrifying debut as they finalize designs and kickstart the manufacturing process for their inaugural electric racecar that will compete in June 2024. Known for their prowess in combustion engine racing, this marks a significant shift towards sustainable technology.

With sustainability at the forefront, the team has been meticulously refining their electric vehicle (EV) design, optimizing every aspect for maximum performance. From aerodynamics to powertrain efficiency, their goal is not only to compete but to excel in the world of electric racing. This ambitious endeavor showcases the university's commitment to innovation and environmentally friendly transportation solutions. It also highlights the growing importance of electric mobility in motorsports, pushing the boundaries of what's possible on the track while promoting cleaner, greener alternatives.

As the team rolls into the manufacturing phase, anticipation is building for their maiden EV racecar's unveiling, promising an exciting future for Michigan State University's Formula Racing Team on the electric racing circuit. *Submitted by Ronak Patel, Project Manager.*

Teaching Award Nomination Form:

Pi Tau Sigma

Pi Tau Sigma is back! We are the mechanical engineering honors society and the MSU Tau Epsilon chapter has been re-established as of Spring 2023. Students are invited to join PTS based on academic excellence; invites for this semester have been sent to prospective members.

Throughout the semester, we hosted and planned a variety of networking, social, and volunteering events for current and prospective members including Eli Lilly and Marathon employee panels, ME Senior Elective Night, Greater Lansing Food Bank food distribution, trivia night, and more! We host ME Senior Elective Night every semester for ME's to gain a student's perspective on offered senior electives, so look out for that in the Spring.

Thank you to everyone who supported us by ordering a MSU mechanical engineering crewneck! We are excited to be back on campus and continue our work supporting our ME students. *Submitted by Steven Coscino and Sara Purdue, Co-Presidents.*

MICHIGAN STATE UNIVERSITY Design Day COLLEGE OF ENGINEERING

Friday, December 10, 2023

Come and see our students lead, create, and innovate

- Competitions
- Demonstrations
- Presentations
- Awards

Deadline: Nov 8

Create Your Resume with AI Technology!

By Bernadette Friedrich, Ph.D., Director of Student Engagement


HARLEY SEELEY

The Center for Spartan Engineering Career Team has introduced a new AI technology to help you create the best resume, while also making sure that it will get through the Applicant Tracking System (ATS) or as we like to say "Beat the Bot". VMock is an on-demand resume review tool leveraging AI to deliver instant and personalized feedback that benchmarks your resume with your College of Engineering Peers. Our VMock was trained by the MSU College of Engineering career staff to make sure that your resume is in the best shape it can be for the employers who recruit at Michigan State University and beyond.

VMock reviews your resume in three distinct ways, presentation, competencies, impact. Presentation is all about how it looks, formatting, spelling, and grammar. Competencies are your skills, how well are you demonstrating both technical and soft skills on your resume. Finally, Impact! Impact is the reflection of your ability to use WHO on your resume. Have you demonstrated to an employer your worth? What outcomes have you talked about?

Basically, you upload your document and the system takes a look and identifies weaknesses in your resume. It will then walk you through the comments and help you to repair any issues that it identified. You can use the Smart Editor to fine tune the details.

Here is what I want to share, this is a tool to help you based on what "WE" know from talking to employers, working with students, and generally having years in this business. But it is still your resume, work with VMock to develop a resume that best represents you in a way that employers will respond positively! You can access VMock from our website: https://www.careers.egr.msu.edu/vmock Once you are happy with your resume, don't forget to upload the new version to Handshake and let's get this job search started!

Don't forget The Center has walk in hours, Monday – Thursday from 12-6 in Room C 108 Wilson Hall, where we can assist you in utilizing VMock, prepare for an interview, or learn how to most effectively navigate Handshake. Juniors and Seniors are also encouraged to take advantage of the "Career Café" located in the main lobby of the Engineering Building for career assistance, employer engagement, and snacks.

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finite element analysis, computational fluid dynamics, machine learning, optimization, and artificial intelligence expand our ability to explore the space of possible design solutions.

Mechanical engineers need to be competent with these tools, and the first step in developing this competence is to learn how to program. Writing code teaches engineers about the ways computers think … and don't think. Nothing is more important to using modern computational tools than watching your carefully written code spit out garbage solutions. While that may sound strange, the first lesson of computational tools is never blindly trust the output. Mechanical Engineers cannot use software as a black box. By writing your own code, you learn the importance of verifying the computational results of any software package you use.

***Finally**, you never know when your career may require coding.*

In your first job, you may get by with computations in Excel or maybe a Matlab script. But I've seen many cases where a problem really needed a well-written piece of Python code. Being flexible in your mechanical engineering career means having a broad set of tools you can use to design, analyze, and test. For the modern mechanical engineer, being able to write a computer program is one of these skills.

So, when you're sitting in a programming class thinking, "I signed up to be a mechanical engineer, why do I have to take this class?" The answer is, because we want you to be an excellent, highly competent mechanical engineer; and learning to program is a key piece of that training and an invaluable career skill.

CartoonStock.com

IMPORTANT: *1) For the latest and most accurate version of any ME concentration, please refer to the Dept. of Mechanical Engineering website. Earlier versions are invalid and will not be honored. 2) You MUST meet with your ME junior/senior advisor and arrange for the concentraiton code to be added to your record PRIOR to applying for graduation. This ensures that the concentration statement will appear on your final transcript.*

COMPUTATIONAL DESIGN CONCENTRATION

(12 Credits)

A mechanical engineering degree with the computational design concentration signifies the interests and expertise of students in computational techniques and approaches for the design and optimization of structural, thermal and fluid systems in engineering applications. To complete a Bachelor of Science degree in mechanical engineering with a computational design concentration, students must complete the requirements for the B.S. degree, including:

• ME 416* Computer Assisted Design of Thermal Systems	3 credits (Fall Only)
• ME 433 Computational Fluid Dynamics	3 credits (Spring Only)
• ME 465* Computer Aided Optimal Design*	3 credits (Spring Only)
• ME 475* Computer Aided Design of Structures	3 credits (Fall Only)

CREDIT DISTRIBUTION: The 12 credits in the concentration will be applied to the Senior Elective requirement (including the "design intensive" course component). Completion of the concentration will be noted on the final transcript.

The asterisk (*) signifies that the course is design intensive.

*▶ME 465 has been **CANCELED** for Spring 2024. Either ME 456 or ECE 448 can be used as a substitute.

AEROSPACE CONCENTRATION

(12 Credits)

A mechanical engineering degree with the aerospace engineering concentration recognizes the expertise of students in subjects related to aerospace applications and to the aerospace industry, which provides many career opportunities for mechanical engineering graduates. Students who meet the requirements of this concentration will have expertise in aerodynamics, propulsion, and structures, supplemented by other strengths in the core Mechanical Engineering degree program.

To complete a Bachelor of Science degree in mechanical engineering with an aerospace engineering concentration, students must complete the requirements for the B.S. degree, including:

•ME 440 Aerospace Propulsion	3 credits (Fall Only)
•ME 441 Aerodynamics and Aircraft Performance	3 credits (Spring Only)

Plus one course from the following list:

•ME 423 Intermediate Mechanics of Deformable Solids	3 credits (Fall Only)
•ME 426 Introduction to Composite Materials	3 credits (Spring Only)
•ME 456* Mechatronic System Design	3 credits (Spring Only)
•ME 475* Computer Aided Design of Structures	3 credits (Fall Only)

Plus one course from the following list:

•ME 422 Introduction to Combustion	3 credits (Fall Only)
•ME 433 Computational Fluid Dynamics	3 credits (Spring Only)
•ME 442* Turbomachinery	3 credits (Spring Only)

CREDIT DISTRIBUTION: The 12 credits in the concentration will be applied to the Senior Elective requirement (including the "design intensive" course component). Completion of the concentration will be noted on the final transcript.

The asterisk (*) signifies that the course is design intensive.

SPRING SEMESTER SENIOR ELECTIVES

▶**The asterisk (✻) after a course number indicates that it has been officially designated as "Design Intensive."** ***The instructor information is subject to change.***

ME 413 Cryogenic-Thermal Systems. 3(3-0). Prereq: (ME 410 or concurrently). *Hasan.*
ME 417✻ Design of Alternative Energy Systems. 3(3-0). Prereq: (ME 410 or concurrently). *Bénard.*
ME 426 Introduction to Composite Materials. 3(3-0). Prereq: (ME 222). *Xiao.*
ME 433 Introduction to Computational Fluid Dynamics. 3(3-0). Prereq: ME 410 or concurrently. *Yuan.*
ME 441 Aerodynamics and Aircraft Performance. 3(3-0). Prereq: (ME 332). *Allison.*
ME 442✻ Turbomachinery. 3(3-0). Prereq: (ME 332). *Mueller.*
ME 445✻ Automotive Powertrain Design. 3(3-0). Prereq: ME 444. *Schock.*
ME 456✻ Mechatronic System Design. 3(2-3). Prereq: (ECE 345 or concurrently) and (ME 391 or concurrently). *Zhu.*
ME 464 Intermediate Dynamics. 3(3-0). Prereq: (ME 361). *Tai.*
ME 477 Manufacturing Processes. 3(3-0). Prereq: (ME 222) and (MSE 250). *Sahasrabudhe.*
ME 478✻ Product Development. 3(3-0). Prereq: (ME 477). *Chung.*
ME 490 Independent Study. 1-4 credits. *See Override Instruction #2 below*. You may reenroll for a maximum of 6 credits.
ME 495 Tissue Mechanics. 3(3-0). Prereq: (ME 222). ***Biomedical Concentration Course***. *Pence.*
ME 497✻ Biomechanical Design in Product Development. 3(3-0). Prereq: (ME 370 or concurrently). ***Biomedical Concentration Course***. *Bush/Nguyen.*
BE 444 Biosensors for Medical Diagnostics. 3(3-0). Prereqs: (BS 161) and (CEM 141) and (ECE 345). ***Biomedical Concentration Course.*** *Alocilja.*
CE 407 Materials Engineering: Properties, Selection and Processing. Prereq: (CE 221) and (ME 222). Recommended Background: MSE 250. TBA.
CHE 483 Brewing and Distilled Beverage Technology. *See Override Instruction #3 below*. See the Schedule of Courses for location information. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410-Heat Transfer or concurrently). *Shriner.*
ECE 448 Modeling and Analysis of Bioelectrical Systems. 3(3-0). Prereq: (PHY 184). ***Biomedical Concentration Course.*** *Saha*
ENE 422 Applied Hydraulics. 3(2-2). Prereq: ME 332. *Pokhrel*.
MSE 465 Design & Application of Engineering Materials. 3(3-0). Prereq: MSE 250. *Eisenlohr.*
Graduate Level Courses: Honors College members and/or students with 3.5+ GPAs might consider taking a graduate course as a senior elective. Before enrolling, several signatures, including that of the instructor, are required. Possible choices for Spring 2022 include ME 814, 825, 861, and 872. *See Override Instruction #4 below*.

SENIOR ELECTIVE OVERRIDE INSTRUCTIONS

1) General Override Request Procedure: Complete and submit the ME Override Request Form: https://www.egr.msu.edu/me/me-override-request Please note that the ME department cannot overfill required courses to resolve conflicts with Senior Electives, Other Electives, Integrative Studies courses and employment schedules.

2) ME 490–Independent Study Enrollment Procedure: Find a professor who is willing to supervise your independent study, and discuss your plans with him/her. Complete an *ME 490/490H Enrollment Contract* (independent study form), available in the ME Department Office in 2555 EB. After you and your professor have completed and signed both sides, return the form to the ME Department Office for the remaining signatures, override, and enrollment.

3) CHE 483–**This course has a maximum enrollment of 100. When it is full, no additional overrides will be given**. It would be a good idea to enroll in a back-up course. To request an override, go to: https://www.egr.msu.edu/chems/index_login.html

4) Complete the *Graduate Course Override* form, which can be obtained from Gaile (griffore@egr.msu.edu).

MICHIGAN STATE UNIVERSITY

ME Advising Office
Dept of Mechanical Engineering
Engineering Building
428 S. Shaw Lane, Rm 2560
East Lansing MI 48824-1226

Fall Semester Calendar

October 30	**Scheduled enrollment begins for Spring 2024.**
November 8	**Deadline for Withrow Teaching Award Nominations.** The nomination form is on the ME website (https://www.egr.msu.edu/me/). [Click on Undergraduate, and then Forms and Policies.]
November 13	**Scheduled enrollment begins for Summer 2024.**
Nov 23-24	Thanksgiving recess
December 10	**Last day of classes & Design Day.**
Dec 11-15	Final Exams
December 16	Undergrad Commencement Ceremony-2:00 p.m. in Breslin. Lasts about 2 hours.
Dec 16-Jan 7	Semester Break
January 12	On-line Open Add Period for Spring 2024 ends. **Also**, May 2024 and August 2024 graduates should apply for graduation by this date.

Undergraduate Program Educational Objectives Department of Mechanical Engineering Michigan State University

(Approved by the ME Department Faculty (August 29, 2022)

***Our graduates will**:*

•Be recognized as competent and ethical engineers practicing in a diverse range of activities.

•Use their mechanical engineering education as a stimulus for personal and professional growth.

•Be recognized for their capability, creativity, leadership, and application of knowledge.

•Be recognized as critical thinkers, both independently and as members of a team, who identify problems and develop effective solutions.