Computer models of childbirth are being developed using rigid body and finite element methods to investigate the effect of various obstetrical maneuvers on the stretch that occurs to the infant’s brachial plexus nerves during the birth process – a phenomenon that results in temporary injury in 1/1000 births and a permanent injury in 1-2/10,000 births. Read Dr. Grimm’s article on pages 8 & 9.

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Building Pyramids
by Professor Ron Averill,
ME Associate Chair

One of my favorite stories is about a traveler walking the streets of ancient Egypt. He sees a man mixing together straw and mud, and he approaches the worker to ask him, “What are you doing?” The worker seems a bit agitated as he points to a pile of bricks nearby and responds, “Can’t you see, I’m making bricks!” The traveler continues down the road, and soon he passes another worker mixing together straw and mud. Again he asks, “What are you doing?” The second worker points to the skyline behind him and says, “Can’t you see, I’m building a pyramid!”

I don’t know the origin of this story, but it’s one of my favorites because it reminds me that what we think about while we work greatly affects what we do, how we do it, and the end results.

For example, the first worker is probably trying to meet his daily quota of bricks so that he can go home and relax. He might be thinking about what’s for dinner tonight, or some other unrelated topic. On the other hand, the second worker is focused on building a pyramid. As he combines the straw and mud, he might be thinking that this very brick could be placed in a critical location in the pyramid, so it needs to have just the right combination of straw and mud. The strands of straw should be oriented properly, and the mud should be compacted really well to remove voids that could spawn cracks. The integrity of the pyramid could depend on this brick. Which brick maker would you rather buy your bricks from?

Like the traveler in the story, when I walk around campus I often ask students, “what are you doing?” I usually get answers like: “Can’t you see, I’m studying for my thermo exam!” or “Can’t you see, I’m trying to finish a dynamics homework assignment that’s due tomorrow!” I never hear answers like: “I’m trying to become a great engineer, so I can develop innovative technologies that serve mankind!” or “I’m trying to become a great doctor, so I can ease suffering and save lives!”

Whatever your end goals are, you should be thinking about them while you are doing the work to achieve them. You must plan and do your work with your goals in mind. Otherwise, it’s too easy to get into the mode of just making bricks, when what you really want to do is build a pyramid.

I fear that many students do not have their end goals in mind while they do their school “work.” For example, often the purpose of doing homework is to “get it done,” not to develop critical skills that will help to make them a great engineer. The goal of studying is to pass a test, not to achieve a deeper understanding of core engineering principles upon which future innovations will be based. The goal of writing a design report is to satisfy a rubric, not to learn how to think critically and communicate clearly.

How would your approach to school be different if you gave serious thought to how each activity might affect your career and life goals?

Instead of closing the book and filing away that homework assignment as soon as it’s “done,” you might spend another ten minutes or so to review your approach, to resolve one or more of the problems that you struggled with, or to ponder how the answers might change under a different set of boundary conditions. Instead of just “looking over” your notes to prepare for that midterm exam, you might solve some extra problems to gain confidence in your solution process and do some extra reading to increase your background knowledge of the subject. Instead of submitting that report online as soon as the final word is typed, you might take a short break and then give it one more round of serious editing. Could the organization or structure be im-

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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Engineering Students – Get your FREE NX Certification!!

Siemen’s has just released a new online NX Certification which is now available for “free” to all students from January 6 - March 27. All you need to do is join the Global Student Challenge. See details in the link below to enhance your portfolio today!!

https://blogs.sw.siemens.com/academic/enter-nxstudentchallenge/

Curriculum News

Co-op Students: BEFORE you leave for your Summer or Fall 2020 co-op rotation, please be sure to discuss your schedule for next Fall 2020/ Spring 2021 with your academic advisor.

Flat Rate Tuition Waiver: If you had to enroll in fewer than 15 credits for Fall 2019 and/or Spring 2020, and can demonstrate the reason for the 12-14 credits of enrollment (needed to work more than 20 hours a week, family responsibilities, academic difficulties, etc.), then you can request the Flat Rate Tuition Waiver. This is for any student level! To make the request, email your academic advisor. (See Academic Advising on this page.)

ME 410–Heat Transfer (3 credits) will be offered both on campus and online this summer. The on-campus version is a First Session course, and the online version is a Full Session course.

ME 451–Control Systems requires department approval before you can enroll. If you have an accurate long-term schedule on file in the ME Advising Office, request approval by submitting the ME 451 Approval Form: https://me.msu.edu/me451-enrollment-ap-

proved? Could you have explained that idea more clearly? Is that figure properly labeled and easy to understand? Thinking about your end goals should change how you go about your business.

So, what are you doing?

IAH/ISS Diversity Requirement:
Each IAH and ISS course emphasizes a form of diversity: national diversity (designated “N” at the end of the course title), international and multicultural diversity (designated “I” at the end of the course title), or both (designated “D” at the end of the course title). Students must include at least one “N” course and one “I” course in their Integrative Studies programs. A “D” course may meet either an “N” or an “I” requirement, but not both.

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 the ME Advising Office.

Academic Advising

1) ME Juniors and Seniors are advised by Gaile Griffore. For an appointment, call 517-355-3338, or go to 2560 EB.

2) ME Sophomores with a 3.1 or higher GPA who will be juniors at the end of this semester are advised by Gaile Griffore. For an appointment, call 517-355-3338, or go to 2560 EB.

3) ME Sophomores who do not fit the criteria in number 2 above are advised by Jeffrey Tsang. Schedule an appointment online during fall and spring semesters:

https://msu.campus.eab.com/
Department News

•Dr. Siva P V Nadim-palli has joined the ME department as an associate professor. He received his Ph.D. from the University of Toronto in 2011. After two years of post-doctoral work at Brown University, he joined the mechanical engineering faculty at the New Jersey Institute of Technology. Dr. Nadim-palli’s research interests focus on experimental solid mechanics, fracture mechanics, and micro and nano mechanics of advanced materials. In his spare time he loves swimming, biking, hiking, playing tennis and cricket, and most outdoor activities. He loves spending time with his sons.

Tutoring

•The ME Learning Center, located in 1237 EB, has mentors for ME 201, 222, and 361. The hours for Spring 2020 can be found here: https://me.msu.edu/me-learning-center [Click on scheduled hours]

•The Guided Learning Center (GLC), located in 1108 EB, offers free drop in tutoring for MTH 234 and 235 and many core engineering courses. To request assistance, go to: https://www.egr.msu.edu/dpo/academics/guided-learning-center

•The Cornerstone & Residential Experience (CoRe) program provides tutoring in courses required for admission to the College of Engineering. Their “drop-in” hours are Sunday through Thursday from 6 - 10 pm in G104 Wonders Hall.

•Plans are in the works to provide tutoring in other courses. Watch for updates on this project!

RWTH – Aachen Program by Dr. Brian Feeny, Program Director

MSU ME students with a 3.0 GPA or higher have the extraordinary opportunity to spend a summer in Germany.

Participants in the MSU-RWTH Aachen exchange program will earn 9 credits via a 5-credit independent study plus a 4-credit German class, and travel in Europe on 3-day weekends. The program runs from mid May to late July. The experience involves interaction with fellow engineering students from around the world at RWTH-Aachen, a premier European technical university. Significant scholarships through the North American Rockwell Endowment can help defray the cost.

Project topics are in the areas of automotive engineering, plastics, advanced and composite materials, textiles, manufacturing technology and automation, bio and chemical processing, wind energy, and aerodynamics. The program has a cooperative agreement with RWTH’s Undergraduate Research Opportunities Program, through which students will have access to tours, trips, and workshops.

Aachen is a blend of an old, historic European city and a modern college town. A well-maintained bike path allows easy intimate access to the nearby small towns, forests and farmlands. An outstanding rail system provides our students easy access to Munich, Paris, Amsterdam, Zurich, Rome, the Alps, the Mediterranean, and many more cultural and natural destinations on their 3-day weekends.

To find out more, please contact me at feeny@egr.msu.edu or 353-9451. This is truly a great opportunity—don’t miss it!

Thinking Outside the Engineering Box by Craig Gunn, Director of Communications

As the text messaging phenomenon becomes all the more powerful, one might think about what is going to happen to the language that we grew up with, learned in school, and cultivated in our own relationships with others. Now we blurt out responses to texts and tweets. We do not formulate responses that require a certain amount of thinking. We just blast away and what comes comes. This is a dilemma for engineers. While it may seem nice to just send text into the universe without any form of fact or rationale, the nature of your profession is built on the premise that what you report is based in fact. Your profession expects it as does the public that relies on you to provide a substantial basis for what you present.

Engineers are a body of people to whom the rest of humanity relies on for improvements to that which exists and to those new innovations that will rocket onto the scene in the future. As you know, engineering is a profession of clarity and exactness. For the engineer to be sloppy and produce text that may carry various meanings, which can for a variety of reasons be misinterpreted, there can be no multiple paths. What an engineer says must be always interpreted in the same way by all audiences. That requires you to investigate your text by yourself and through your readers.

All the advances in devices meant to help with communication have seemed to open the doors to what is now a truly communication generation. It may well also be a time when
the new generation of engineers emerging into this world of communication will need to take the reins of innovation and be forced to keep a check on language that fails to communicate in an exact manner. This may seem to be outside the scope of the engineer, but with the innovations will come the responsibilities that go with those innovations. Perhaps our newest graduates will become the language protectors of the future. It is not science fiction!

American Society of Mechanical Engineers

The American Society of Mechanical Engineers is an organization that enables collaboration, knowledge sharing, career enrichment, and skills development across all engineering disciplines, specifically geared toward mechanical engineers.

ASME here at MSU gives mechanical engineers the opportunity to connect with each other and get involved on campus. Each semester we host student design competitions, such as junkyard wars or a 3D printing competition. We also volunteer at community schools to help young people get interested in engineering and host corporate information sessions for our members to learn more about industry and connect with employers.

ASME is a great way for mechanical engineers to build their resumes and make an impact on the community. We are hosting a festival called E-Fest North for the second year in a row April 5th-7th and we are going to need a lot of volunteers. Please visit our website or Facebook to learn how to get involved with ASME! Submitted by Christopher Fadanelli, President.

AIAA

The American Institute of Aeronautics and Astronautics is a professional organization that forwards inquiry, collaboration and career enrichment in aerospace-related fields.

“...I joined AIAA as VP of the Michigan State section in fall of 2019. I joined because I have a passion for all things aerospace and it seemed like a great way to get involved, especially since MSU does not currently have an aero program [major]. Once a member, I received an email from AIAA encouraging me to introduce myself on this forum called AIAA Engage. I immediately did and posted about my dreams and what I wanted to accomplish in the field along with my qualifications to get there. What I didn’t see coming were the responses I received from the community – it was wonderful! Many people commented and asked questions and gave advice, and I even received two direct messages from employers looking to interview me for a position, one of which happened to be at NASA! Although I have only been a member for less than a year, AIAA has already impacted my life in a very positive way that will help me tremendously throughout my career. My experience with AIAA so far has been phenomenal and I encourage everyone who is interested in aerospace to join and really get involved.” – Molly Janasik

On Thursday, April 2nd at 6:00 p.m., the AIAA will present a lecture by the distinguished astrodynamist Mr. Daniel Adamo. (Location TBA) Mr. Adamo’s lecture will explore the feasibility of routine interplanetary spaceflight in the near future, and specifically a concept, known as Aquarius, for a reusable human transport. We hope to see you there! Submitted by Douglas Heine, President.

Pi Tau Sigma

Pi Tau Sigma is a Mechanical Engineering Honor Society instituted in order to establish a closer bond of fellowship among high achieving students in Mechanical Engineering. Members are inducted by invitation only into this highly regarded organization to benefit from being part of a community of like-minded individuals dedicated to the society’s core values of integrity, service, and leadership and to academic success within the major of mechanical engineering. In light of this dedication, Pi Tau Sigma members will be offered the opportunity to be a compensated tutor for classes in which they have excelled. Those who think they may be eligible to join should monitor their email for an invitation and initiation events coming up this semester. Submitted by Megan Phanrisvong, President.

Design Day

Friday, April 24, 2020
Engineering Bldg

Come and see our students lead, create, and innovate

- Competitions
- Demonstrations
- Presentations
- Awards
Department of Mechanical Engineering

Dean's List

Congratulations to these 562 ME majors who made the Dean’s List after Fall 2019. To be on the Dean’s List, you must have a semester GPA of 3.5 or better. This list is from January 27. For updates, go to:

https://reg.msu.edu/ROInfo/GradHonorsDeansList.aspx

216 Seniors to Graduate in May and August!

Congratulations and best wishes to all ME graduates! On behalf of the 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 February 21. If your name is missing, please contact me immediately at griffore@egr.msu.edu (Tele: 517-355-3338).—Gaile

May Graduates

David Abatan
Christian James Abbate
Samuel Millard Addy
Andrew Fisher-Lee Albright
Ali A Alhajji
Amariido Alijai
Jimmy Nezar Almacdissi
Hadi Hassan Alnaji
Ghali Abd Alwaijih
Timur Kamilevich Aminov
Scott Elton Anthony
Matthew Thomas Arenz
Rachel Marie Arnold
Austin Michael Aselage
Albert John Asta
Sadab Raimah Bahar
Ryan Gregory Ball
David Jaebang Bang
Cameron Paul Bargahn
Wyatt Smyles Beachy
Madison Lynn Begen
Allison Juliet Bell
Marcell Benkes-Toth
Matthew Collins Bergdolt
Adam Brian Bolyard
Jordan Patrick Bommarito
Latif Abdoul Bouda
Michael James Bowen
Zachary Willis Brei
Joseph Carl Brenton
Jacob Roberts Broman
Rourke James Ambruce Brumette
Abbigail Catherine Bugenske
Thomas William Burke
Cameron Thomas Cabana
Devon Weijia Cao
Justin Owen Carbery
Brenden John Carter
Brandon K Chan
Brian K Chan
Hongxiang Chang
Nan Chi
Austin Thomas Coha
Thomas John Cook
Alex Peter Counseller
Mira Nicole Crain
Torre Golding Crown
Emma Leigh Curd
Trevor Cletus Dame
Devon John Davenport
Devan James Dejong
Evan Patrick Drew
Steven Nicholas Dubey
Tyler J Dubois
Derek Robert Edwards
Rachael Anna Emerick
Nathan Thomas Engler
Christopher Darius Fadanelli
Michael Reece Falter
Ryan Paul Fantin
Victoria Ann Farrell
Brian Nelson Fedewa
Jake Robert Fosmoeu
Brendan Robert Frenzcli
Taylor Alfred Fuhrman
Gregorio Leite Gaio
Nicholas Michael Gerich
Kayla Johanna Gibbs
Justin Michael Gilgallon
Tyler Jack Gleason
Adam R Goodes
Spencer C Goosen
Rishi Raaj Gupta
Neil M Haakenson
Hexin Han
Bradley Jay Harris-Bey
Karl Matthew Havens
Harrison Ian Haynor
Joseph Thomas Hegger
Christopher Paul Heilman
Ryan Michael Heinez
Robert Andrew Hernandez
Hoffman, Grant Thomas
Zachary Douglas Hoffman
Brett Chandler Howe
Michelle Huang
Taylor Dawn Jacobs
Minir Jakupi
Rachael Kristine Jannette
Owen Gregory Jarl
Michael B Johnson
Ryan Eric Kalis
Melissa Rose Karas
Jacob Daniel Bascom Keller
Liam Joseph Kelly
Ross Jackson Kelly
Danielle Nicole Keusch
Hyang Jip Kim
Kevin Andrew Kinsey
Alexander Stephen Kraski
Zachary Adam Kubiak
Niranjan Vishwambhar Kulkarni
Zachary Stephan Kupa
Sean Daniel Labadie
Gi Hwan Lee
Yeeun Lee
Wei Yu Li
Dylan James Lott
Fanghan Lu
Julia Frieda Lutz
Nuno J Marriott
Scott Alexander Maxey
Dillon H McClintock
Christopher Thomas McGinnis
Erin Elizabeth Mettler
Andrew Emerson Mizer
Emily Lauren Money
Hunter Jones Moore
Mitchell Grant Morin
Nehemiah Steven Mork
Jacob Robert Morrison
Robert William Mothersell
Radhika Murgai
Todd Alan Myers
Mikayla Anastasia Nitoski
Timothy Michael Ohtake
Garrison Scott Osborne
Emily K Oswald
Nicholas Pak
Mausam Sanjeev Patel
Vincent Gene Pernicano
Kent Dalton Peterson
Cameron Michael Ploss
Alexander William Pomaville
Kurtis Joseph Potier
Michael Jonathan Powers
Diego Arroyo Prakash
Andrew Winhau Quang
Daniel James Quinn
Kyle Joseph Raymo
Jack Ellison Rees
Dominic Daniel Rende
Matthew Thomas Rice
Alyse Nicole Richards
Noah Leslie Moss Rimatzki
Samuel James Rinke
Taylor Nicole Ruelle
Joseph Patrick Russell
Brendan Thomas Rybicki
Alyssa Marie Salciccioli
Tariq Yusef Salim
Elizabeth Marie Schester
Ethan Robert Schrader
James Richard Schradle
Michael Jordan Schultz
Lucas Anthony Serraioco
Jacob D Sicklesteel
Thomas Matthew Smither
Justin Philip Stasevich
Conner Allen Stevenson
Jayme Lynn Stiglich
Jeremy D St Pierre
Jacob Thomas Stuifbergen
Stephen Jack Taylor
Caden Kirk Swindell
Paul Allan Systsma
Mouyad Tabatbe
Pankti H Tank
Joshua Kenneth These
Nicholas Robert Thiel
Joseph Maxwell Troy
Claire Nicole Trygstad
Tomoki O Tsuchiya
Nadine George Twal
Benjamin Joseph Vitek
Lucas Adam Walsh
Wei Yue Wang
Zhiyao Wang
Aaron Michael Warstler
Benjamin Martel Washington Jr
Brent Michael Weakland
Megan Samantha Weiss
Stephen William Wernette
Foster Gregory Whipple
Sterling D White
Nicholas Christopher Wiggins
Leah Elizabeth Williams
Connor Matthew Wilson
Derek Thurston Wittenberg
Zijing Wu
Hannah Rose Wyatt
Xiaoyu Xiong
Dong Yang
Yongyi Yang
Volkan Yildirim
Gabrielle Leeann Zapolnik
Elias Zepeda-Barragan
Haoyang Zhang
Jin Rong Zhang
Qiliang Zheng

August Graduates

Joseph Ragheed Abbawi
Naif Saeed Alzahrani
Zahji Billingslea
Nikolaus A Buchholz
Jeremy Andrew Coleman
Mia Danielle Gilreath
Lindsay Marie Goodrich
Yash Gupta
Paul Jaewon Han
Tianyu Han
David Kumiega
Stephen Nicholas Oberheim
Warren Fischer Purvin
Fanghao Shi
Gabrielle E Wink
Kyle C Woods
Haoran Zhang
The research group of Michele Grimm, the Wielenga Creative Engineering Endowed Professor in Mechanical Engineering, has a broad range of research areas – but three major emphases.

The Wielenga Creative Engineering Endowment focuses on developing and assessing novel pedagogical methods that can improve student success in engineering education (Figure 1). By supporting student learning throughout their engineering programs, the goal is to increase graduation rates and decrease time to degree – all while improving the readiness of engineers to enter the workforce after graduation. Goals for this aspect of the program include developing learning communities and supporting faculty within the ME Department and the College of Engineering in general in assessing novel pedagogies. In addition, Dr. Grimm has received funding from the MSU HUB to support an innovative project this semester that uses a game-based design for a virtual, laboratory-like experience to support active learning for the students in ME 495-Tissue Mechanics.

Branching out of this interest in engineering education, the Grimm research group also includes projects that focus on design science – the processes that engineers use to develop innovative and successful designs for new systems and components. All engineers are required to do some design work during their education, but how can the design process be improved among both students and practicing engineers to truly expand innovation as well as ensure that the designed systems actually meet the needs of the intended users? Through her work with the White House Task Force on Technology for Aging and the National Academy of Medicine’s Commission on a Global Roadmap for Healthy Longevity, Dr. Grimm has developed a significant interest in how engineers of all backgrounds can design and implement the key systems that are needed to support an increased health span among the aging population. Through her own students as well as through collaborations with other engineering faculty, she hopes to improve our understanding of the science of design so

Figure 1. Student learning and success can be positively impacted through a number of pedagogical improvements, including the introduction of inquiry-based learning in engineering classes.
that it can be better applied to device development using a user-centered approach (Figure 2).

Finally, stemming from her background in biomedical engineering, the primary scientific questions that Grimm’s research group addresses focus on understanding the mechanisms of injury to newborn infants that occur during the birth process. Labor and delivery in childbirth is a truly mechanical process, one that exposes the infant to high levels of force. Injuries occur during the birth process, including fractures to bones of the arm, shoulder, and skull as well as nerve injuries that result in paralysis. This is not an area that can be studied experimentally, as it would be unethical to expose infants to potentially injurious levels of force in order to understand the mechanisms of these injuries. Therefore, the Grimm group is developing computer models of the birth process (see graphic on page 1), including both maternal and infant anatomy and tissue properties in order to better understand how the infant responds to the natural and clinician-applied forces that are present during labor and delivery. By understanding how these injuries occur, Grimm and her team hope to work with clinicians to improve or prioritize responses to unforeseen occurrences during deliveries, such as a shoulder dystocia (when the shoulder gets stuck during delivery).

Figure 2. User-centered design – and developing ways to truly understand the needs of the intended users – is key to designing systems that will support global goals of healthy longevity. The Grimm research group combines research into design science with opportunities to apply those practices in system design.
About Cryogenic Engineering by Dr. Pete Knudsen

Cryogenic engineering involves the mechanical and thermal-fluids design of systems that operate at temperatures from liquefied natural gas down to helium (from -260 to -452 degrees Fahrenheit).

These systems are necessary nationally and internationally for the aerospace, industrial gas, and power industries, and for government and private organizations performing sub-atomic particle and low-temperature research. To design such systems, it is necessary to understand non-ideal fluid and material properties. In addition, thermal-mechanical optimization and integration is inherent in their design.

MSU’s College of Engineering and its Mechanical Engineering Department, in collaboration with the Facility for Rare Isotope Beams (FRIB) at MSU, offer three cryogenic engineering courses to introduce students to various aspects of the field. Available courses:

ME 414-Cryogenic Systems Mechanical Design is offered during fall semesters. It focuses on:
- Mechanical design of cryogenic piping systems
- Analysis of stresses due to process conditions such as pressure, temperature, and momentum
- Optimization and trade-off of the thermal and mechanical design
- Incorporation of non-constant material properties
- ASME design codes (to give students an understanding of what is required in the industry)

ME413-Cryogenic Systems Analysis is offered during spring semesters. It focuses on:
- Thermodynamics of cryogenic process cycles
- Ideal cycles and real cycles
- The concept of exergy (or availability)
- Modeling of components
- Cryogenic distillation (how gas mixtures with boiling points substantially below the environment are separated)
- Vacuum systems (integral to the thermal insulation)
- Instrumentation

Every other fall, the graduate class ME 940-Cryogenic Process Engineering is offered. This class continues where the previous two classes left off, focusing in greater detail on the thermal-fluid process design and analysis aspects of cryogenic systems. This course is planned for Fall 2020.

The MSU Cryogenic Initiative (frib.msu.edu/cryoinitiative) is a collaboration between FRIB and MSU’s College of Engineering. It offers opportunities for graduate students interested in applied research in cryogenic engineering. Contact Dr. Venkatarao Ganni (ganni@frib.msu.edu), Dr. Pete Knudsen (knudsen@frib.msu.edu), or Dr. Nusair Hasan (hasan@frib.msu.edu) for more information.

Temperature–entropy diagram for FRIB’s Central Helium Liquefier (CHL)

Simplified schematic of FRIB’s Central Helium Liquefier (CHL)

FRIB’s Sub-atmospheric Cold Box (SCB) which houses five cryogenic centrifugal compressors necessary to achieve 2 Kelvin.
ATTENTION: SENIORS

REPORT YOUR

GRADUATION PLANS HERE
Michigan State Formula Racing proudly represents Michigan State University in Formula SAE, the world’s largest collegiate design series, which challenges students to design and build a small, open-wheel race car from the ground up each year.

Recently, the MSU Board of Trustees approved a $4 million budget for the construction for a new engineering design team facility. This will be an incredible upgrade from our current home, and will improve our team’s capabilities for years to come. We would like to thank both the generous donors and the College of Engineering for prioritizing this great initiative.

After over nine months of hard-work and dedication, our newest vehicle, the SR-20, drove for the first time. This is one of the proudest moments of the year for our team, and marks the beginning of the testing season. As we approach our first competition in May, team members devote countless hours to fine tuning vehicle parameters to ensure optimal performance.

This racing season, we will be attending five competitions, which include all three FSAE sanctioned competitions: FSAE Michigan, North, and California. These competitions allow us to baseline our designs against the best teams in the world, and to show the world what Spartan engineers can achieve. Be sure to follow us on social media for updates throughout the racing season! @msuformularacing on Facebook and Instagram.

Go green. Go white. Go fast! Submitted by Christopher McCloskey, Project Manager and Chassis Lead
Baja SAE

The MSU Baja Racing Team is an official SAE Collegiate Design Team which designs, builds and competes with an off-road Baja buggy each year. The team, which is student led, provides a unique opportunity for engineers to develop crucial hands on designing and manufacturing experience preferred by many companies, as well as leadership opportunities.

The team has been hard at work this year and will soon be unveiling our car for this year. Starting in the fall, students have learned how to use NX and FEA on a real world application and consider the manufacturing methods to make each part. After that, students are taught how to operate the machines in our shop to make their parts and how to interact with companies to order parts. The Baja team is a great opportunity for developing skills learned in the classroom and for building a professional network. *Submitted by Zac Brei, Project Manager.*
ME Senior Electives for 2020-2021

• The following ME Senior Elective list was accurate as of March 2, but it is subject to change. Important changes will be emailed to you with “ME Bulletin Update” on the subject line.
• Design Intensive courses have an asterisk (*) after the course number.
• Descriptions are provided for courses that are not in the catalog. All others can be found by going to https://reg.msu.edu/Courses/Search.aspx.
• The ME department cannot overfill a required course or section to solve a Senior Elective schedule conflict.
• Instructor assignments had not been finalized when the newsletter went to press. They will be posted later on the Schedule of Courses website.

• Course override instructions can be found in the shaded box on page 15.

SUMMER SEMESTER

ME 490 Independent Study. 1-4 credits. See Override Instruction #2 on page 15. You may reenroll for a maximum of 6 credits.

ME 465*: Computer Aided Optimal Design. 3(3-0). Prereq: (ME 222 and ME 280) and (ME 370 or concurrently).

FALL SEMESTER

ME 414*: Mechanical Design of Cryogenic Systems. 3(3-0). Prereq: (ME 470 or concurrently).

ME 416*: Computer Assisted Design of Thermal Systems. 3(4-0). Prereq: (ME 410 or concurrently).

ME 422 Introduction to Combustion. 3(3-0). Prereq: (ME 332 or concurrently).

ME 423 Intermediate Mechanics of Deformable Solids. 3(3-0). Prereq: (ME 222).

ME 425 Experimental Mechanics. 3(2-3). Prereq: (ME 222).

ME 440 Aerospace Propulsion. 3(3-0). Prereq: (ME 332).

ME 444 Automotive Engines. 3(3-0). Prereq: (ME 410 or concurrently).

ME 475*: Computer Aided Design of Structures. 3(3-0). Prereq: (ME 370).

ME 477 Manufacturing Processes. 3(3-0). Prereq: (ME 222 and MSE 250).

ME 490 Independent Study. 1-4 credits. See Override Instruction #2 on page 15. You may reenroll for a maximum of 6 credits.

ME 491*: Selected Topics in Mechanical Engineering. Section 001. Topic: Integrated Systems Design. See Override Instruction #1 on page 15. Students should consider taking this course for three semesters to receive a total of 3 credits and fulfill the design intensive senior elective requirement. This is a project based course and students should be available outside of class for team meetings, project work, and design reviews. Prereq: None. Recktenwald/ Resh.

ME 491 Selected Topics in Mechanical Engineering. Section 002. Topic: Biomechanical Analysis of Human Movement. See Override Instruction #1 on page 15. Course Description: Experimental methods used in the biomechanics of human movement. Topics will include equipment used for capturing movement (e.g. motion capture, force plates, EMG), data analysis techniques, and reviews of important studies in the biomechanics literature. Emphasis will be on writing code in MATLAB for data analysis. Applications of these techniques to human movement from different contexts (e.g., gait, sports, ergonomics) will be discussed. Prereq: (ME 370 or concurrently). Biomechanical Concentration Course.

ME 494 Biomechanics and Heat Transfer. 3(3-0). Prereq: (ME 410 or concurrently). Biomedical Concentration Course.

CHE 472 Composite Materials Processing. 3(2-3). Prereq: (ME 332).

CHE 483 Brewing and Distilled Beverage Technology. See Override Instruction #6 on page 15. Class meeting on Mondays is scheduled in ANH 1279 and the hours arranged are located at MBI, 3815 Technolgy Blvd., Lansing, MI. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410 or concurrently).

ECE 415 Computer Aided Manufacturing. 3(2-3). Prereq: (ME 451). See Override Instruction #3 on page 15.

ECE 445 Biomedical Instrumentation. 3(2-3). Prereq: ECE 345. Biomechanical Concentration Course.
MSE 425 Biomaterials & Biocompatibility. 3(3-0) Prereq: (MSE 250). Recommended Background: (PSL 250).

Biomedical Concentration Course. For more info, see Override Instruction #4 on page 15.

MSE 476 Physical Metallurgy of Ferrous & Aluminum Alloys. 3(3-0). Prereq: (MSE 250). Recommended background: MSE 310. For more info, see Override Instruction #4 on page 15.

ME 812 Conductive Heat Transfer. 3(3-0). See Override Instruction #5 on page 15. Prereq: (ME 412 plus GPA of 3.5+).

ME 830 Fluid Mechanics I. 3(3-0). See Override Instruction #5 on page 15. Prereq: (ME 332 plus GPA of 3.5+).

ME 860 Theory of Vibrations. 3(3-0). See Override Instruction #5 on page 15. (Prereq: ME 461 plus GPA of 3.5+).

SPRING SEMESTER

ME 413 Cryogenic-Thermal Systems. 3(3-0). Prereq: (ME 410 or concurrently).

ME 417:* Design of Alternative Energy Systems. 3(3-0). Prereq: (ME 410 or concurrently).

ME 426 Introduction to Composite Materials. 3(3-0). Prereq: (ME 222).

ME 433 Introduction to Computational Fluid Dynamics. 3(3-0). Prereq: (ME 410 or concurrently).

ME 441 Aerodynamics and Aircraft Performance. 3(3-0). Prereq: (ME 332).

ME 442:* Turbomachinery. 3(3-0). Prereq: (ME 332).

ME 445:* Automotive Powertrain Design. 3(3-0). Prereq: (ME 444).

ME 456:* Mechatronic System Design. 3(2-3). Prereq: (ECE 345 or concurrently) and (ME 391 or concurrently).

ME 464 Intermediate Dynamics. 3(3-0). Prereq: (ME 361).

ME 465:* Computer Aided Optimal Design. 3(2-3). Prereq: (ME 222 and 280) and (ME 370 or concurrently). Online Course.

ME 477 Manufacturing Processes. 3(3-0). Prereq: (ME 222 and MSE 250).

ME 478:* Product Development. 3(3-0). Prereq: (ME 477).

ME 490 Independent Study. 1-4 credits. See Override Instruction #2 below. You may reenroll for a maximum of 6 credits.

ME 491:* Selected Topics in Mechanical Engineering. Section 001. Topic: Integrated Systems Design. See Override Instruction #1 on page 15. Students should consider taking this course for three semesters to receive a total of 3 credits and fulfill the design intensive senior elective requirement. This is a project based course and students should be available outside of class for team meetings, project work, and design reviews. Prereq: None. Recktenwald/ Resh.

ME 495 Tissue Mechanics. 3(3-0). Prereq: (ME 222). Biomedical Concentration Course.

BE 444 Biosensors for Medical Diagnostics. 3(3-0). Prereq: (BS 161) and (CEM 141 or 151) and (ECE 345). Biomedical Concentration Course.


CHE 483 Brewing and Distilled Beverage Technology. See Override Instruction #6 Below. Class meeting on Mondays is scheduled in ANH 1279 and the hours arranged are located at MBI, 3815 Technolgoy Blvd., Lansing, MI. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410 or concurrently).

ENE 422 Applied Hydraulics. 3(2-2). Prereq: (ME 332).

MSE 465 Design & Application of Engineering Materials. 3(3-0). Prereq: (MSE 250). Possible choices for Spring 2021 include ME 825, 861, and 872. See Override Instruction #5 below.

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 2021 include ME 825, 861, and 872. See Override Instruction #5 below.

** OVERRIDE INSTRUCTIONS **

1) Submit the ME Override Request Form: [https://me.msu.edu/me-override-request](https://me.msu.edu/me-override-request)

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 Advising Office in 2560 EB. After you and your professor have completed and signed both sides, return the form to the ME Advising Office for the remaining signatures, override, and enrollment.

3) Six seats in ECE 415 have been allocated for MEs who are on record as Manufacturing Concentration students. To be “on record,” you must meet with Gaile to plan a long-term schedule. To request an override, email Gaile griffore@egr.msu.edu and be sure to include your PID number with your request. NOTE: A prerequisite override will be given to students who will need to take ECE 415 & ME 451 concurrently.

4) ME majors do not need to have taken the Recommended Background courses, but you will probably need to do some additional background reading. Contact the instructor for more information.

5) Complete the Graduate Course Override form, available in the ME Advising Office in 2560 EB. This is a paper form.

6) CHE 483—To request an override, submit the CHE Override Request form: [https://www.egr.msu.edu/chems/override/index.php](https://www.egr.msu.edu/chems/override/index.php)
Spring Semester Calendar

March 9  Scheduled appointments begin for enrollment for Summer 2020. Your enrollment access date is posted in StuInfo.
March 27  Computer enrollment begins for Fall 2020 / Spring 2021.
April 2    Lecture by distinguished astrodynamicist Daniel Adamo. 6:00 p.m., Location TBA. Sponsored by AIAA.
April 5-7  E-Fest North. Volunteers are needed! Please visit the ASME website or Facebook to learn how to get involved!
April 24  Design Day in the EB. See you there!
April 27-May 1 Final Exams.
May 1      University Undergraduate Student Convocation—1:00 p.m. in Breslin.
May 3      College of Engineering Undergraduate Commencement Ceremony, 12:30 p.m. in Breslin. Lasts about 2 hours.
May 11-June 25 First Summer Session.
June 29-Aug 13 Second Summer Session.
May 11-Aug 13 Full Summer Session.
August 13   Initial Fall 2020 Minimum Tuition & Fee payment due.
September 2 Fall Semester classes begin.

MSU is an affirmative action, equal opportunity employer. MSU is committed to achieving excellence through cultural diversity. The university actively encourages applications and/or nominations of women, persons of color, veterans and persons with disabilities.