Professor Yang Guo works on manufacturing and materials processing with particular interests in the mechanics of metal cutting and sliding and advanced machining processes such as vibration assisted machining and functional surface generation. Read about Dr. Guo’s research on page 8.

Professor Anthony Wins Teaching Award!

Traumatic Knee Injury and Related Disease

“Everything is Awesome!” – The Lego Movie

Spring 2017 Senior Electives
Department of Mechanical Engineering

Department News

• Dr. Yang Guo has joined the ME department as an assistant professor. After receiving his Ph.D. in industrial engineering from Purdue University in 2012, Dr. Guo pursued postgraduate studies at Purdue and then worked as an R&D engineer for M4 Sciences LLC in West Lafayette, IN. Dr. Guo’s research focuses on manufacturing, machining, control and automation, metrology, and experimental mechanics. Dr. Guo enjoys reading, watching movies, running, and playing soccer.  Be sure to read about his research on page 8.

• Dr. Like Li has joined the ME department as an academic teaching specialist. Dr. Li received his Ph.D. in mechanical engineering from the University of Florida in 2013. Since then he has been a postdoctoral research associate at the University of Pittsburgh. This semester he is teaching one section of ME 201 and both sections of ME 391. In his spare time, Dr. Li enjoys reading, outdoor running, basketball, and traveling back to Florida to see his wife Jing and little baby Andrew.

• Dr. John McGrath, Professor Emeritus, has come out of retirement to teach both sections of ME 410 this semester. Dr. McGrath received his Ph.D. from the Massachusetts Institute of Technology in 1977 and was a member of the MSU ME department from 1989 to 2002 when he accepted a position as department head at the University of Arizona. Since then he has served as an ex-officio member of the National Institutes of Health, a division director of the National Science Foundation, and Vice President for Research at Central Michigan University. Dr. McGrath enjoys sports, music, traveling, eating, drinking and spending time with his wife, three kids, their spouses and [two- soon to be four] grandkids. He is a big Spartan fan- especially basketball and football. He plays a little guitar but can’t sing.

• Dr. Ricardo Mejia Alvarez has joined the ME department as an assistant professor. Dr. Mejia Alvarez received his Ph.D. in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign in 2010. He spent the next few years as a postdoctoral research associate and research scientist at the Los Alamos National Laboratory. He conducts research in the area of fluid mechanics including experimental research of turbulent flows, hydrodynamic instabilities, and compressible flows. Dr. Mejia-Alvarez is a rock climber, a tango dancer and a lover of fine cuisine.

• Dr. Yuping Wang has joined the ME department as an academic teaching specialist. She received her Ph.D. in mechanical engineering from the University of Missouri-Rolla in 2004, and since 2009 she has been a lecturer in the ME department at the University of Michigan-Dearborn. This semester Dr. Wang is teaching ME 422-Introduction to Combustion. Dr. Wang enjoys reading, music, and traveling. She loves spending time together with her husband and two kids.

• Dr. Ranjan Mukherjejee is Chair of the Dynamic Systems and Control Division in ASME that hosted the 2016 Dynamic Systems and Control Conference in Minneapolis in October: https://www.asme.org/events/dscc

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.

Send all correspondence to: Gaile Griffore, Newsletter Editor Dept. of Mechanical Engineering Michigan State University 2560 Engineering Building East Lansing, MI 48824-1226 Telephone: 517-355-3338 griffore@egr.msu.edu

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Curriculum News

Co-op Students: Before you leave for your Spring 2017 co-op rotation, be sure to discuss your schedule for next Fall 2017 / Spring 2018 with your academic advisor.

ME 481–ME Design Projects 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 481 Approval Form: [http://www.egr.msu.edu/me/undergraduate/forms-undergraduate](http://www.egr.msu.edu/me/undergraduate/forms-undergraduate). If you do not have an accurate long-term schedule on file, schedule an appointment with Gaile by calling 355-3338 or stopping by 2560 EB. NOTE: May and August graduates who will have completed ME 471 and are at least concurrently enrolled in ME 410, may be eligible to take ME 481 next fall. Ask Gaile if you qualify.

ME 489–Technical Communications (2 credits) is on the spring schedule. Instructor: Craig Gunn, ME Director of Communications. IMPORTANT: This course is an Other Elective. It is not a Senior Elective.

ME 491/603–Automotive Noise and Vibration (3 credits) will be offered Spring 2017 as a non-design intensive Senior Elective. For more information, see page 15.

Class Standing. ME juniors and seniors can obtain this information in 2560 EB. Sophomores should go to W-8 Wilson. Be prepared to show your MSU I.D.

Job Search Advice: The Center is available to answer questions about your job search. To ask a question or schedule an appointment, go to 1340 EB or call 517-355-5163. Or, email the office at: 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 the ME Advising Office.

Tutoring

• The ME Learning Center in 1237 EB, has mentors for ME 201, 222, and 361 at 6-10 p.m. on Sunday through Thursday. Here is the schedule for Fall 2016: Sunday–ME 201 & 222 / Monday–ME 201, 222, & 361 / Tuesday–ME 201 & 361 Wednesday–ME 201, 222, & 361 / Thursday–ME 222 & 361 Friday and Saturday—Closed

• The Guided Learning Center (GLC) in 1108 EB, offers free drop in tutoring in math up to differential equations, science courses (chemistry, physics, etc.), and many core engineering courses. To request assistance, go to: [http://www.egr.msu.edu/dpo/academics/guided-learning-center](http://www.egr.msu.edu/dpo/academics/guided-learning-center)

• The Cornerstone & Residential Experience (CoRe) program offers free tutoring in G24 Wonders Hall on Sunday through Thursday from 6 - 10 pm. This “drop-in” setting provides help for MTH 132, 133; CEM 141, 151; and PHY 183.

• ME graduate student and Pi Tau Sigma undergraduate tutors can be contacted through the ME Advising Office. These tutors charge a fee, which you can negotiate with them. If you are interested, email Gaile Griffore at griffore@egr.msu.edu

Undergraduate Program Educational Objectives
Department of Mechanical Engineering
Michigan State University
(Approved by the ME Department Faculty on December 10, 2015)

Our graduates will:
• Be 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, and application of knowledge.
• Be independent and critical thinkers who identify problems and develop effective solutions.

Academic Advising

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

2) Sophomore juniors-to-be with a 3.1 GPA are advised by Gaile Griffore. For an appointment, call 355-3338, or go to 2560 EB.

3) Sophomores who do not fit the criteria in number 2 above will be advised by Joyce Samuel until a new advisor is found, hopefully by January. Schedule an appointment with her online at: [https://login.msu.edu/?App=ShibbSSC-GradesFirst](https://login.msu.edu/?App=ShibbSSC-GradesFirst)

4) ME Freshmen are advised in W-8 Wilson Hall on a walk-in basis only.

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.
Professor Rebecca Anthony received the 2016 Withrow Award!

Dr. Manooch Koochesfahani, Associate Dean for Graduate Studies and Faculty Development, Dr. Rebecca Anthony, and Dr. Leo Kempel, Dean of the College of Engineering.

Professor Rebecca Anthony received the 2016 Withrow Teaching Excellence Award last spring at a special awards luncheon 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.

Dr. Rebecca Anthony, an assistant professor in the Department of Mechanical Engineering, is described as a professor who cares immensely for her students. She works to make sure that her students succeed and actually learn the material. Students remarked that Dr. Anthony understands the way they think and she actively guides them in their understanding of concepts.

One student clearly explained her dedication to teaching, “She takes time explaining concepts with passion and patience.” Dr. Anthony’s classroom is a place in which questioning is welcomed; she is always ready to answer those questions that open the doors to further learning. This approachable nature makes her a remarkable teacher. Her enthusiasm and attitude toward teaching led another student to comment, “She brought excitement back to class!” For these reasons and many more, the Department of Mechanical Engineering was proud to present Dr. Rebecca Anthony as a worthy recipient of the Withrow Teaching Award.

Dr. 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 then stayed at UMN to do postdoctoral research on the diagnostics of dusty plasmas. She joined the MSU ME department in the fall of 2013. Dr. Anthony enjoys outdoor activities such as hiking, running, and cross-country skiing, and also spends time on art projects and cooking adventures. She is teaching ME 201 this semester.

History of the Withrow Teaching Excellence Award

Prior to 1991, ME was the only department in the College of Engineering with an annual teaching award, and it was called the ME Outstanding Faculty Award. In 1991 ME alumnus Jack Withrow and his wife Dortha endowed the award and made it available to all engineering departments. The name was changed to the Withrow Teaching Excellence Award. The Withrows also endowed several additional awards to recognize distinguished scholarship and service by engineering faculty and staff. Here is a list of past teaching award recipients, including those who transferred to ME from the old MSM department in 2001:

1984 Ronald Rosenberg
1985 Charles St. Clair
1986 Merle Potter
1987 Craig Somerton
1988 Ronald Rosenberg
1989 Charles St. Clair
1990 Alan Haddow
1991 Manooch Koochesfahani
1992 Craig Somerton
1993 John McGrath
1994 Alan Haddow
1995 Dählin Liu (MSM)
1996 Brian Feeny
1997 John Foss
1998 Robert Hubbard (MSM)
1999 Alex Diaz
2000 Indrek Wichman
2001 Ronald Rosenberg
2002 Patrick Kuon (MSM)
2003 Alan Haddow
2004 Farhang Pourboghrat
2005 Craig Somerton
2006 Gary Cloud
2007 Clark Raddcliffe
2008 Ahmed Naguib
2009 Ranjan Mukherjee
2010 Giles Brereton
2011 Tonghun Lee
2012 Indrek Wichman
2013 Scott Kiefer
2014 Laura Genik
2015 Brian Thompson
2016 Rebecca Anthony
Are You Creative?
by Craig Gunn, Director of Communications

In thinking about that question. 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 misinformation 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 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 and creation 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.

93 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 10. If your name is missing, please contact me immediately (Email Gaile at griffore@egr.msu.edu Tele: 517-355-3338).

Jared Hannibal Abood
Rachael Kelley Acker
Saad Ahmed Baabibi
Faisal Hani Bakir
Alyssa Lian Bartlett
Mark Anthony Becker
Andrew Gregory Benson
Jonathan David Bianchi
Daniel Edward Blair
Andrew Donald Boyer
Cody Glenn Bradford
Joseph Warren Brooks
Daniel Patrick Busch
Miriam Waithera Chege
Luyi Chen
Christopher Michael Churay
Mark Remo Cogo
Sagar Dangal
Herbert Van Wyck Darrow
Wesley Craig Dorin
Zachary Forrest Dutcher
Avinash Honnavalli Dutt
John Patrick Ellbogen
Kyle Joseph Foco
Brandon Eric Fortman
Shane M Frakes
Jacqueline Frances Frey
Michael William Gaduski
Matthew Michael Gagnon
Shuowei Geng
Joseph Marshall Genoa
Alexander Robert Gerdin
Trevor Richard Gilmartin
Zachary Davidson Graves
Tunan Guo
Christine Danielle Hampton
Matthew Bruce Hart
Mark Henry Hartfield
Yu He
Danielle Marie Heger
Trevor David Herrington
Shane Matthew Hessling
Matthew Kyle Hitch
Alexander Hy Ho
David Raymond Jagow
Maryrose Isabelle Jakeway
Yewei Jiang
Lucas Timothy Johnson
Ryan David Juntunen
Andrew James Kalina
William Patrick Kelly
Michael Stephen Kron
Kevin Robert Lalko
Wesley Michael Lanigan
Brandon Philip LeBlanc
Jaemin Liu
Abigail Jean Livingston
Daniel Allan Lumley
Matthew Joseph Maier
Ahmed Ghassab Marji
Kendra Martin
Scott Baetz Matthews
Jack Duncan McDougall
Erik Joseph McGuire
John Ryan McLaughlin
David Michael Meleca
Andrew Michael Morgott
Stephen Robert Moye
Ian Rice Mular
Nathaniel Joseph Noel
Mitchell Joseph O’Brien
Eric Alan Olsen
Alejandro Alberto Porras
Jeremy Edward Reisig
Daniel Luke Riggs
Elizabeth Ann Schaepe
Christopher Slamp
Guangchao Song
Darby Marie Spiegel
Tyler Stricker
Daniel James Summers
Jordan Lee Timm
Richard Quang Tran
Aaron Thomas Urbonya
Andrea Marie Vedrody
Steven Edward Ward
Morgan Aileen Weber
Evan Scott Weider
Eric C West
Takahiro Yuasa
Louis Victor Yun
Shangyou Zeng
Haonan Zhou
MSU – RWTH Aachen Program
by Prof. Brian Feeny, Program Director

College is a great time in life for trying new experiences, and a fantastic way to broaden your experiences is to take part in a Study Abroad program. Our exchange program with RWTH Aachen, Germany, provides a summer experience where you can work on an applied engineering project in an advanced facility, tour fascinating sites, savor European foods and beverages, soak in the ambiance of languages and culture, and meet new people. By doing a study abroad, you will get immersed in an environment with not just unique scenery, but where you can witness first hand different ways of meeting basic needs that are easily taken for granted.

MSU ME students with a 3.0 GPA or higher have the amazing opportunity to (a) live in Aachen, Germany (mid-May to end of July 2017), (b) earn 5 credits independent study plus 4 credits German language and culture, and (c) travel in Europe with planned 3-day weekends, i.e., the motto is “Work hard, play hard!” The experience will involve interaction with fellow engineering students from around the world at RWTH-Aachen, a premier European technical university. The city center is a blend of an old, historic European city and a modern college town. The superb rail system allows our students easy access to Munich, Paris, Amsterdam, Zurich, Rome, and many more destinations on their 3-day weekends. Those with a wanderlust for nature might consider places like Verdon Gorge in France, the Alps, Germany’s Jasmund National Park, or Stromboli in Italy.

Note: Scholarship funds are available through the North American Rockwell Endowment.

The Aachen Program has been very successful over the years, thanks to the enthusiastic work of retired Professors John Foss and John McGrath, who built, refined and sustained this program over the past 30-plus years.

Find out more! If interested, try to attend the information session on Tuesday, October 25, in 1420 EB. Otherwise, please contact me at feeny@egr.msu.edu or 353-9451. A great way to get more information is to talk to former exchange students. They enjoy sharing their experiences with the program. Let me know, and I can help you get in contact with former Aachen exchange students. Don’t miss this opportunity!

MSU – Denmark (DTU) Program

Denmark is a tiny country that has some castles that can best be described as magical. This country of mermaids and Vikings as well as delightful pastries and lovely beaches can enchant any tourist, which is why people come here year after year in search of the many pleasures that a Scandinavian country has to offer. You will find something here that caters to every taste. Whether it’s the Tivoli Gardens or the popular beaches that can be found in Legoland and no matter what your age is, there is plenty for you to enjoy in Denmark.

In 1829, when Hans Christian Ørsted founded what became the Technical University of Denmark (DTU), he created an eloquent response to an important need in society: to make use of scientific progress in the service of society by applying technology. DTU has applied this fundamental idea for the past 177 years. Based on intensive efforts in research, innovation and the transfer of knowledge, DTU has contributed to Denmark achieving a leading position within such diverse fields as design, wind energy, biotechnology, electronics and telecommunication. DTU thereby deserves a substantial share of the credit for Denmark being able, despite its modest size, to create and maintain a welfare society that is the envy of many nations. DTU, claims the role as a leading force within the technical and natural sciences seriously.

ME students may study Fall and Spring at The Technical University of Denmark in Lyngby, and courses are offered in English. They provide education, research and innovation at a high international level. This is a great study abroad opportunity for students at ME majors.

Figure 1. A cobblestone street in downtown Aachen, February 2016.
Machining Research Challenges by Professor Yang Guo

Machining (or metal cutting) is the primary subtractive process, and it is widely used to manufacture metal components in major industries such as automotive, aerospace, biomedical, etc. Machining realizes metal shape by incrementally removing material as chips from a metal surface by driving the cutting tool(s) against the surface. Depending on the cutting tool geometry and how the tool and workpiece are driven in motion, there are different machine tools to conduct different machining processes, such as turning, milling, drilling, grinding, etc.

These processes are suitable for making various geometric features. Turning is used for making axisymmetric features; milling is good for planar features or contour; drilling is used for hole features; and grinding is particularly useful for creating very smooth surfaces. Computer numerical controlled (CNC) machines have significantly increased the capability, productivity and accuracy of these machining processes. Compared with other manufacturing processes such as metal forming, casting, or additive processes, machining can achieve higher dimensional accuracy, tighter tolerance, and better surface finish, which makes it indispensable for manufacturing critical engineering components with more stringent requirements.

As machining is used to manufacture the designed shapes or geometric features, it also induces changes in material microstructure and property due to the thermomechanical loading intrinsic to the process. These changes often occur on the machined surface, a layer of thickness from a few micrometers to hundreds of micrometers. Although occurring within only a thin surface layer, they can very much influence the functional performance and service life of the machined component. For example, tensile residual stresses may be induced on the surface by machining, which will reduce the fatigue life of the component by promoting surface crack initiation. Therefore, one challenge in machining research is to better understand and predict the integrity of machined surfaces, including the roughness, hardness, residual stress and microstructure.

Another challenge in machining research arises from the continuing adoption of new materials for product development. As the new materials provide improved properties and performance, they often become difficult to machine, meaning high cutting force and temperature, rapid tool wear, and undesired surface integrity. Examples of difficult-to-machine materials include titanium-based alloys, nickel-based alloys and certain types of steel. Machining productivity for these materials is often low and the machining cost is very high. There is a strong need for solutions for machining these materials more efficiently.

My research group at MSU tries to address these challenges, beginning with understanding the underlying...
physics of the metal cutting process. Despite the different types of machining processes, the fundamental physical phenomenon in the cutting of metal (or chip formation) is actually the plastic deformation of the metal local surface. It is this plastic deformation that determines the process states (cutting force, heat dissipation and temperature) and the process outcomes (chip morphology and machined surface integrity). Understanding and being able to control this deformation are crucial to addressing challenges in machining research. In our research, we use high-speed imaging and digital image correlation (DIC) techniques to directly measure the actual material flow and deformation in metal cutting (Figure 1). We use the finite element method (FEM) to model the cutting deformation closely based on our experimental measurement. The combined experimental and modeling efforts will lead to the creation of a more accurate computational model to predict cutting deformation and hence the machining outcomes.

The direct observation and quantification of material flow have already revealed new insights in the chip formation process. For example, ductile fracture can occur at different length scales resulting in variations of chip morphology and surface strain (Figure 1b). In another example, chip plastic flow can be highly “sinusoidal” suggesting a folding type deformation which has never been recognized before (Figure 1c). We also found that the unconfined free surface plays an important role in triggering these plastic instability and ductile fractures. The chip plastic flow is intrinsically unsteady and does not take the form that consumes the minimum energy.

Based on the insights obtained from our fundamental research, we are able to develop new machining methods with an emphasis on controlling and optimizing the plastic flow. One method is constrained machining in which a constraint is applied on the free surface ahead of the cutting tool (Figure 2a). In constrained machining, flow instability and ductile fracture due to the presence of free surface can be suppressed, resulting in a more homogeneous deformation and hence better surface quality. Another method is modulation-assisted machining (MAM) in which a low-frequency oscillation is superimposed onto the cutting tool feed motion (Figure 2b). By controlling the frequency and amplitude of the oscillation, the continuous cutting process can be transformed into an intermittent cutting process. This creates many benefits such as discrete chip formation, incipient deformation, better tool lubrication, etc. MAM has shown unprecedented improvements in some of the most challenging machining applications, including deep hole drilling and high-speed turning of difficult-to-machine materials.

Figure 2 Schematics of (a) constrained machining and (b) modulation-assisted machining.
The knee is one of the most often injured joints in the body. Involvement in sports heightens the risk of knee injury, especially to soft tissues like the anterior cruciate ligament (ACL) and meniscus. In the field, players are subjected to rigorous physical actions such as jump landings and sudden directional changes resulting in severe impacts to the knee joint (Figure 1). While this may result in gross soft tissue damages that are treated by surgeons, occult damage to other tissues of the knee are currently not treated. Thus, it is not surprising that studies of patients suffering similar injuries show that regardless of surgical reconstruction after traumatic knee injury, there remains a significant risk of a long term, chronic disease called post-traumatic osteoarthritis (PTOA) (Figure 2).

Many researchers have used a rabbit model in which the ACL is surgically cut in the laboratory environment to study the consequences of joint injury. This model, however, does not represent the impact induced soft tissue injury that is known to occur during a traumatic event. Hence, we at the Orthopaedic Biomechanics Laboratories (OBL) have developed a novel impact model to study localized changes in joint tissues following traumatic injury.

At the OBL a newly funded project is undergoing that aims at evaluating immediate, targeted treatment of occult knee joint damage resulting from severe knee impaction. In this research knee impaction is imposed on anesthetized Flemish Giant rabbits resulting in gross as well as occult soft tissue injuries. The occult soft tissue damage manifests itself in acute death of the cells embedded within the tissues of the knee, i.e. meniscus and cartilage. These cells are critical for maintenance of healthy tissue and thus acute repair of these damaged cells is a likely treatment option. Thus, a novel pharmaceutical treatment is being evaluated for its effectiveness at ameliorating cell death following traumatic injury and thereby helping to arrest further degeneration of joint tissues. It is likely that this research will add to the current regimen of treatments already in place to treat severe knee injuries and lead to better outcomes in a clinical setting.

The research project is in collaboration with Colorado State University and has been funded by the US Department of Defense (DoD). Dr. Loic Dejardin, an orthopaedic surgeon from the MSU College of Veterinary Medicine, is also a Co-Investigator of the project. The study will take three years to complete, and clinically relevant outcomes will be shared with the scientific community via peer-reviewed publications and presentations at international orthopaedic conferences.

The OBL (www.obl.msu.edu) is looking for motivated undergraduate and graduate students with biomechanical background to participate in various activities of this research project.
In the realm of co-op, internship, and full-time employment, things have certainly been “awesome” over the past year for Spartan Engineers! It has been exciting to see the level of interest that has been expressed in hiring top talent from the College of Engineering, ranging from local employers to corporations coast-to-coast!

This year, the staff at The Center from Spartan Engineering is fielding calls and hosting employers for meetings from a wide range of companies looking to reconnect or engage with MSU for the first time, as experiential and entry level opportunities are plentiful across the nation. With the implementation of joinhandshake.com, the platform for students to connect with employers and professional networking events, students can easily connect with employers, whether they are coming to campus or not! It is important to login to your page every week, as postings for Spring and Summer 2017 are already posted with interviews coming up fast!

The Co-op Partnership Program has also seen growth this past year, as we have 20 partners representing a mix of industries, including automotive, furniture and design, defense, biomedical, and other hot industries for ME’s. Co-ops can range from 3 to 12 months in length, so it is important keep an open mind when discussing co-op, as companies define and structure their programs very differently from the east to the west coasts.

On the full-time and internship side, the Spartaneering Partners have been very active this year as well, beginning with our Partners’ Week in mid-September. During the second week of classes, the halls of the Engineering Building were filled with our corporate recruiting partners, who were actively seeking candidates for full-time, co-op, and internship positions across the nation through luncheons, highlight presentations, resume critiques, and the second ever Partners’ Showcase!

Following the Showcase, engineering students were continuously offered a wealth of occasions to network with employers through ASK Sessions, resume critiques, and practice interviews. These activities all lead to what became the largest recruitment event that the College of Engineering has hosted on its grounds, which was the 1,500+ attendee Engineering Pre-Gallery Co-op / Intern Exchange, where over 110 companies came to hire students purely for experiential opportunities! The event expanded to two days this year, allowing the college to host over 30 additional employers and 300 more students than previous years.

On the horizon, the Engineering Expo (February) and Spring Break Corporate Tour (March) are major events that are hosted by the college in the spring, but companies will maintain a presence on campus in the meantime. Continue to apply for jobs, engage with the staff at The Center for Spartan Engineering, attend corporate mixers, and ask questions, as there are thousands of opportunities available.

Nominate your favorite professor for the 2017 Withrow Teaching Excellence Award!
Deadline: Friday, Nov. 18
Nomination Form:
https://www.surveymonkey.com/r/9L7XFL8?sm=%2bRG2TFgG4jCe5sFAC2WKGQ%3d%3d
The Michigan State Baja SAE Racing team annually designs, builds, and races an off-road vehicle to compete in Baja SAE competitions. The team began its design for the 2016-2017 season during the summer, and aims to finish the design by November 1st. The team will simultaneously begin manufacturing the new car in mid-October, completing the car by mid-March. After the car is complete, they will drive the car on the team’s test track collecting data about the car’s performance and making any final modifications. The team is then ready to compete.

MSU competes in the three Baja SAE events that take place in the United States each year. About 100 college teams participate in each of the three US competitions. For the 2016-2017 season, these competitions will take place in California, Kansas, and Illinois. Each competition requires students to balance cost with design and dynamic performance while following a strict set of safety regulations and standardized rules. Competitions are four days long during which teams compete in five dynamic (driving) events and three static (presentation) events. The dynamic events include: an acceleration drag, a maneuverability course, a suspension and traction course, a hill climb or sled pull event, and a four-hour endurance race. The static events include: a design presentation, a sales presentation, and cost report.

If you would like to learn more about MSU Baja and how to get involved, feel free to stop in at one of our weekly meetings on Wednesdays at 6:30 p.m. in room 2320 Engineering Building. You can also check out our website: msubaja.com. Submitted by Oscar Scheier, Project Manager.

Ray Renaud, 2016 Co-Chief Engineer of the MSU Baja team, gets big air in the team’s car “Ace” during the endurance race at Baja SAE Tennessee Tech.

The Tau Epsilon Chapter of Pi Tau Sigma, the International Mechanical Engineering Society, has had a very busy start to the semester. We held our informational meeting for interested initiates on Oct 10th and had a great turn out! Our first social event, ‘Wings Night’ at Buffalo Wild Wings was on Oct. 20th. We enjoyed socializing with one another while enjoying some delicious wings. Also, we had a great time volunteering at STEM day with Women in Engineering on Oct 22nd and hosting the Balancing Fun activity which demonstrates functions of movement.

We will be hosting a Mechanical Engineering Senior Elective presentation on Wednesday, October 26th at 7:30 pm in 2400 EB. This event aims to inform students about their ME senior elective options and gives them a chance to ask questions from those who have already taken the courses. This will be both fun and informative and is open to members and nonmembers!

Later in the semester, we look forward to volunteering with Habitat for Humanity and playing some Euchre and other activities at our game night, one of our fun social traditions. Finally, we will hold initiation at the end of November to induct new members. For more information on Pi Tau Sigma or any of our events, please visit our website at www.egr.msu.edu/pts. Submitted by Abigail Henning, President.
Every year, students on the Formula SAE Racing team work hard to design, manufacture, and test a small open-wheel racecar. Last year, the team took 5th place out of 120 teams at the largest competition in the world, Formula SAE Michigan. Formula SAE is the world’s largest engineering design competition with over 500 schools competing from around the globe, and Michigan State is currently ranked 17th. We have just finished the design of our new car and we are currently transitioning into the manufacturing phase.

Students on the team gain experience in design, analysis, manufacturing, and testing. The whole car is designed in CAD and all structural components are analyzed using Finite Element Analysis (FEA) software or physical testing. Students also run Computational Fluid Dynamic (CFD) analyses, engine performance simulations, suspension kinematic simulations, composite structure analyses, and more.

Last month we attended the 2016 Toronto Shootout. We placed 1st in the Drivers Championship and 2nd in the Constructors Championship, securing the fastest time of the day. The whole team had a great time and it was an amazing way to end our season.

If you would learn more about the team, please visit [http://www.egr.msu.edu/fsae](http://www.egr.msu.edu/fsae) or contact Brandon Miller at mill2546@msu.edu. Submitted by Trevor DeLong, Business Operations Leader.

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ASME

The MSU Student Chapter of the American Society of Mechanical Engineers is a non-profit student organization. The main purpose of ASME is to introduce MSU students to the world of engineering. ASME provides an opportunity for students to meet representatives of leading industrial companies; this allows them to learn about these companies as well as possible internship/employment opportunities. ASME will be hosting a variety of events throughout the 2016-2017 school year: social events, company information sessions, community outreach, and design challenges. Events like these are a great way for ASME members to network with recruiters as well as their fellow classmates. Some of ASME’s non-company partnered events include Junkyard Wars, Career Gallery How-to’s, Impression Five exhibit, and a trip to the North American International Auto Show.

In addition to our regular events, we will be holding special events in South Neighborhood so make sure to be on the lookout for flyers and emails!

To learn more about our upcoming events, please visit our Facebook page at [https://www.facebook.com/ASMEatMSU/?fref=ts](https://www.facebook.com/ASMEatMSU/?fref=ts) and our website at [http://msuasme.weebly.com/](http://msuasme.weebly.com/) for more information. Submitted by Kyle Hawkins, President.
AUTOMOTIVE POWERTRAIN CONCENTRATION

A mechanical engineering degree with the automotive powertrain concentration attests to the interests and expertise of students in subjects that are of direct relevance to today’s automotive industry. This industry, which is currently dominated by vehicles powered by internal combustion engines, adapts rapidly to technological changes and environmental regulation and provides many career opportunities for mechanical engineering graduates. Students who meet the requirements of this concentration will have expertise in fundamentals of combustion, modern applications of computational fluid mechanics and heat transfer, and a range of technical aspects of today’s vehicle powertrains.

Requirements:

- ME 422 Introduction to Combustion 3 credits (Fall Only)
- ME 444 Automotive Engines 3 credits (Fall Only)
- ME 445* Automotive Powertrain Design 3 credits (Spring Only)

Plus one course from the following list:

- ME 433 Computational Fluid Dynamics 3 credits (Spring Only)
- ME 442* Turbomachinery 3 credits (Spring Only)

COMPUTATIONAL DESIGN CONCENTRATION

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.

Requirements:

- 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)

ENERGY CONCENTRATION

Mechanical engineers contribute greatly to the development of technologies to convert energy from one form into another. Automobile powertrains convert the chemical energy of fossil or biofuels into the kinetic energy of a moving car. Wind turbines convert the kinetic energy of the wind into electrical energy for the power grid. The fundamental courses of mechanical engineering (e.g., thermodynamics, fluid mechanics, vibrations) provide an essential understanding needed to model, analyze, and design many means of energy conversion. The energy concentration is designed to provide undergraduate students with a more thorough understanding of the analytical, computational, and experimental methods for developing means to convert energy to useful forms from various sources. These skills have applications beyond energy conversion for power generation and apply to many areas of mechanical engineering and other interdisciplinary fields. This concentration is well suited for preparing students for industrial careers, as well as for graduate study.

Requirements:

- ME 416* Computer Assisted Design of Thermal Systems 3 credits (Fall Only)
- ME 417* Design of Alternative Energy Systems 3 credits (Spring Only)
- ME 422 Introduction to Combustion 3 credits (Fall Only)

Plus one course from the following list:

- ME 440 Aerospace Engineering Fundamentals 3 credits (Fall Only)
- ME 442* Turbomachinery 3 credits (Spring Only)
- ME 444 Automotive Engines 3 credits (Fall Only)

CREDIT DISTRIBUTIONS: The 12 credits in each concentration will be applied to the Senior Elective requirement (including the “design intensive” course requirement). Completion of a concentration will be noted on your 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.”

- **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. *This course will be taught with graduate students who will take the course as ME 840, and who will have different assignments. If you have questions, contact the instructor.*
- **ME 442** Turbomachinery. 3(3-0). Prereq: ME 332.
- **ME 445** Automotive Powertrain Design. 3(3-0). Prereq: ME 444.
- **ME 464** Intermediate Dynamics. 3(3-0). Prereq: ME 361.
- **ME 465** Computer Aided Optimal Design. 3(3-0). Prereq: (ME 222 and 280) and (ME 371 or concurrently).
- **ME 477** Manufacturing Processes. 3(3-0). Prereq: ME 222, MSE 250.
- **ME 478** Product Development. 3(3-0). Prereq: ME 477.
- **ME 490** Independent Study. 1-4 credits. See Override Instruction #1 below. You may reenroll for a maximum of 6 credits.
- **ME 491** Selected Topics in Mechanical Engineering. Section 603: Automotive Noise and Vibration. See Override Instruction #2 below. Course Description: Automobiles are one of the most complex and expensive machines that an individual will purchase and use. Vibrations in a vehicle can affect vehicle durability, safety, performance, customer comfort, and even the decision of whether or not to purchase the vehicle. This course will focus on the engineering application of mechanical vibrations to vehicles including: different sources of vehicle vibrations, how these can affect different vehicle systems, driver perception of noise and vibration, and engineering approaches to control vehicle noise and vibration.
*Prereq: (ME 461 or concurrently).*
- **ME 495** Tissue Mechanics. 3(3-0). Prereq: ME 222. Biomechanical Concentration Course.
- **ME 497** Biomechanical Design in Product Development. 3(3-0). Prereq: ME 371 or concurrently. Biomechanical Concentration Course.
- **BE 444** Biosensors for Medical Diagnostics. 3(3-0). Prereqs: (BS 161) and (CEM 141) and (ECE 345). Biomechanical Concentration Course.
- **CHE 483** Brewing and Distilled Beverage Technology. See Override Instruction #4 below. Location: 2000 Merritt Road, East Lansing. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410-Heat Transfer or concurrently).
- **CHE 483** Brewing and Distilled Beverage Technology. See Override Instruction #4 below. Location: 2000 Merritt Road, East Lansing. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410-Heat Transfer or concurrently).
- **CE 407** Materials Engineering: Properties, Selection and Processing. Prereq: (CE 221) and (ME 222). Recommended Background: MSE 250. Lu.
- **ENE 422** Applied Hydraulics. 3(2-2). Prereq: ME 332. Pokhrel.

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 2017 include ME 814, 825, 861, and 872. See Override Instruction #4 below.

**OVERVIEW INSTRUCTIONS**

1) 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.

2) Complete and submit the ME Override Request Form: [http://www.egr.msu.edu/me/form/me-override-request](http://www.egr.msu.edu/me/form/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.

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

4) CHE 483–To request an override, submit the CHE Override Request form: [https://www.egr.msu.edu/chems/index_login.html](https://www.egr.msu.edu/chems/index_login.html)
Fall Semester Calendar

November 11  All currently enrolled students who have not enrolled by 8 p.m. in at least one course for Spring will pay a $50 late fee.

November 18  Deadline for Withrow Teaching Award Nominations. The nomination form is located at: https://www.surveymonkey.com/r/9L7XFL8?sm=%2bRG2TFgG4jCeSSFAC2WKGQ%3d%3d

October 26  Senior Elective Night at 7:30 p.m. Location: 2400 EB. Sponsored by Pi Tau Sigma.

Nov 24-25  Thanksgiving recess

December 11  Last day of classes & Design Day.

December 17  Undergrad Commencement Ceremony-Breslin at 2 pm. Lasts about 2 hours. No tickets required.

Dec 12-16  Final Exams

Dec 17-Jan 8  Semester Break

January 13  On-line Open Add Period for Spring 2016 ends at 8 p.m. ALSO, deadline for May 2017 and August 2017 graduates to apply for graduation.

March 20  Scheduled Computer/Telephone Enrollment period for summer semester begins.

April 1  Computer Enrollment period for fall/spring 2017-2018 begins. Your enrollment access date will be posted on StuInfo in mid-March.

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.