MECHANICAL ENGINEERING UNDERGRADUATE SYMPOSIUM

2015

DECEMBER 10, 2015

COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

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Welcome

On behalf of the Mechanical Engineering Department at the University of Michigan, we would like to welcome you to the Fall 2015 Mechanical Engineering Undergraduate Symposium (MEUS).

MEUS provides a venue for our exceptional undergraduate students to showcase their projects from RISE (Research, Innovation, Service and Entrepreneurship) as well as their Design and Manufacturing X50 courses.

In RISE, our undergraduate students leverage our state-of-the-art facilities working side-by-side with internationally-renowned faculty to tackle cutting edge projects that impact our society. Projects range from dynamics and controls to gas and engines, advanced manufacturing, and medical devices!

Running concurrent to the MEUS poster and presentation sessions is Design Expo. Have an exciting day cheering for the ME 250 teams in their project competition, view the ME 350 four-bar linkage that automatically positions a mirror to reflect several laser beams onto a target, and engage with our seniors as they display their ME 450 capstone design projects.

The goal of MEUS is to provide an intimate forum for a vibrant exchange of ideas and results within our University of Michigan ME Community. We are thrilled with the exceptional response. Our sincere appreciation goes to all the students and their RISE/X50 mentors for choosing to share their very best work at MEUS. The planning of MEUS has been a significant team effort of faculty, staff and students. Our thanks go to them for assembling such an outstanding event.

Kon-Well Wang, PhD
Tim Manganello/BorgWarner Department Chair and
Stephen P. Timoshenko Collegiate Professor of Mechanical Engineering

MEUS Planning Committee

MEUS Technical Planning Committee

Diann Brei	MEUS Chair
Claus Borgnakke	Session Chair
David Dowling	Session Chair
Amy Hortop	ME 450 Course Coordinator
Jonathan Luntz	Session Chair
Chinedum Okwudire	Session Chair
Kenn Oldham	Poster Judge
Gabor Orosz	Session Chair
Jwo Pan	Poster Judge
Alan Wineman	Poster Judge
Mike Umbriac	ME 250 Course Coordinator / ME 350 Course Coordinator

MEUS / RISE Organizers

Ken Arbogast-Wilson
Rachel Casanova
Jacob Hayward
Linh Huynh
Katie Morningstar
Sarah Sobek
Nikki Taylor-Vargo
Michele Wong

Schedule at a Glance

1. Dynamics and Control
Session Chair: David Dowling
Room: 2636 GGBA

10:40 AM - 12:20 PM

3. Advance Manufacturing
Session Chair: Chinedum Okwudire
Room: 2636 GGBA

1:30 PM - 2:30 PM

5. Advance Manufacturing II
Session Chair: Gabor Orosz
Room: 3590 GGB

3:00 PM - 4:00 PM

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2. Gas and Engines
Session Chair: Claus Borgnakke
Room: 3350 GGB

12:00 PM - 1:00 PM

4. Medical Devices
Session Chair: Jonathan Luntz
Room: 3350 GGB

1:30 PM - 2:30 PM

Poster Session and Reception
BorgWarner Galleria
(Open to ME students participating in Design Expo or MEUS)

4:00 PM - 5:30 PM

RISE: Research, Innovation, Service, Entrepreneurship

Through the RISE program, mechanical engineering undergraduate students leverage our state-of-the-art facilities working alongside internationally-renowned faculty to tackle cutting edge projects that impact our society. The Mechanical Engineering Undergraduate Symposium (MEUS) is the accumulation of the students' work.

During the day, seniors in ME 490 will present their RISE projects in 20 minute presentations. Everyone is welcome to attend these sessions and ask probing questions!

Sophomores and juniors conclude their projects with a poster session during the evening reception, where students will be available to discuss their projects in detail. The posters will also be on display during the day, if you are unable to attend the reception.

The public is invited to peruse the posters, attend presentations, and interact with the students throughout the day.

RISE Sessions

Session 1. Dynamics and Controls

Session Chair: David Dowling

Room: 2636 GGBA

10:40 AM **Harris Recon Drone**
STUDENT: Sean Flemming
INSTRUCTOR: Kira Barton

11:00 AM **Running Controller for a Bipedal Robot in Simulation and Hardware**
STUDENT: Kevin Green
INSTRUCTOR: C. David Remy

11:20 AM **Closed-Loop Position Control of an Automated Treadmill**
STUDENT: Oles Synyutka
INSTRUCTOR: C. David Remy

11:40 AM **Implementation of the Continuum Approximation and Splash Dynamics of a Vertical Cylinder in Water**
STUDENT: Jalil Alidoost
INSTRUCTOR: Eric Johnsen

12:00 PM **DE Self-Folding Origami**
STUDENT: Anna Buzolits
INSTRUCTOR: Diann Brei

Session 2. Gas and Engines

Session Chair: Claus Borgnakke

Room: 3350 GGB

12:00 PM **Substitution of Natural Gas for Electrical Industrial Drying: A Cost Saving Strategy**
STUDENT: Hayden Youngs
INSTRUCTOR: Claus Borgnakke

12:20 PM **Fuel Research with IQT and Low Temperature Combustion Characteristics of Pentane Isomer**
STUDENT: Iljin Eum
INSTRUCTOR: Andre Boehman

12:40 PM **DoE SCRE Boosted Engine and Methods for Improving Knocking Threshold via DI and PI**
STUDENT: Evan Harris
INSTRUCTOR: Andre Boehman

Session 3. Advanced Manufacturing I

Session Chair: Chinedum Okwudire

Room: 2636 GGBA

1:30 PM **Nanofluidic Analysis of Air Bubble Defects in Nanoimprint Lithography**
STUDENT: Nan Li
INSTRUCTOR: Xiaogan Liang

1:50 PM **Commercial FDM to E-Jet Conversion**
STUDENT: Thomas Brown
INSTRUCTOR: Kira Barton

2:10 PM **3D Printing for Prototypes of Thin-Film PZT/ Polymer Microstructures**
STUDENT: Clark Teeple
INSTRUCTOR: Kenn Oldham

Session 4. Medical Devices

Session Chair: Jonathan Luntz

Room: 3350 GGB

1:30 PM **Modeling Motion of Micro-Mirrors Used in Medical Endoscopes**
STUDENT: Eric Harding
INSTRUCTOR: Kenn Oldham

1:50 PM **Electrode Insertion Success with Focus on Geometric and Material Considerations**
STUDENT: Shaun Marshall
INSTRUCTOR: Albert Shih

2:10 PM **Cell Phone Based Miniaturized Coagulation Monitoring Platform for Point-of-Care Diagnosis**
STUDENT: David Peyer
INSTRUCTOR: Jianping Fu

5. Advanced Manufacturing II

Session Chair: Gabor Orosz

Room: 3590 GGB

3:00 PM **Conversion of Commercial 3D Printer to E-Jet**
STUDENT: Ryan Tepper
INSTRUCTOR: Kira Barton

3:20 PM **An Investigation of Compliant Electrodes for Application in Dielectric Elastomers**
STUDENT: Samuel Gregory
INSTRUCTOR: Diann Brei

3:40 PM **Secure Cloud Manufacturing Multidisciplinary Design Project**
STUDENT: Aleyna Kapur
INSTRUCTOR: Kira Barton

Poster Session and ME Reception

BorgWarner Galleria

4:00 PM—5:30 PM

Mechanical Engineering is pleased to conclude the day's activities with a reception to celebrate a successful semester for the ME Community and to announce the RISE and X50 Award winners.

ME 290 Posters

Modularity
STUDENT: Gregory Cunningham INSTRUCTOR: Bogdan Epureanu

Powertrain Strategies for the 21st Century
STUDENT: Kunal Haria INSTRUCTOR: Margaret Wooldridge

Analysis of Equine Motion and Gait Using Camera Based Kinematics and Wearable Sensing Technology
STUDENT: Annika Stoldt INSTRUCTOR: C. David Remy

ME 390 Posters

Magnetic Field Effects on C. elegans Locomotive Behavior
STUDENT: Syeda Maisa INSTRUCTOR: Bogdan Epureanu

DE Self-Pumping Peristaltic Hose
STUDENT: Kaitlyn Sharon Holmstrom INSTRUCTOR: Diann Brei

Predict Tipping Point of Physiological Critical Illness
STUDENT: Minqi Lin INSTRUCTOR: Bogdan Epnureanu

Heat Exchanger Design for Experimental Studies of EGR Cooler Fouling
STUDENT: Archit Gupta INSTRUCTOR: Andre Boehman

Ideation Flexibility
STUDENT: Jennifer Wenger INSTRUCTOR: Steve Skerlos

RISE Awards

We are pleased to hold three competitions for this year's Mechanical Engineering Undergraduate Symposium: Best Poster, Best Session, and Best Paper.

Best Poster Award

All RISE ME 290 and ME 390 students will be automatically entered to compete for the Best Poster Award. The best poster will be judged by faculty based upon quality of the project work, the poster, and the presentation of the work.

Winners of the award will be honored at the reception with a certificate and monetary award.

Best Session Award

All RISE ME 490 students that present at MEUS will be automatically entered to compete for the Best Session Award. Judges will attend the presentations and will select the best of each session based upon the quality of the presentation and the project work.

Winners of each award will be honored with a certificate.

Best Paper Award

The top MEUS award is the Best Paper Award. The judges will review the final papers from the winners of the Best Session Award to select the best overall project based upon the quality of the project work and the presentation in both oral and written forms.

The winner of the Best Paper Award will be honored with a certificate and monetary award.

ME X50 Projects

The Michigan Engineering Design Expo is held concurrently with the Mechanical Engineering Undergraduate Symposium (MEUS).

The Design Expo showcases the achievements of our students in engineering design and prototyping, and demonstrates applications of their studies that solve real-world problems.

Students in mechanical engineering design and manufacturing courses (ME 250, 350, and 450), will present their projects for the Design Expo during the ME Undergraduate Symposium.

ME 250 Design and Manufacturing I

BorgWarner Galleria

1:00 PM - 3:00 PM

In ME 250, the students learn engineering drawing; CAD and solid modeling; use of mechanical elements such as bearings, gears, and springs; engineering analysis; and manufacturing processes. They get hands-on experience using machine tools such as a milling machine, lathe, laser cutter, and water jet cutting machine, as well as a 3D printer.

In the course project, the students put their knowledge to use. They work in teams of four to design and build a remote-controlled machine that must compete to move objects in an arena. The students learn to choose a strategy, generate concepts for the design, perform analysis on their concept, and then design the individual components. They are given a kit of materials which they can use to manufacture the components using the student machine shop. They test and validate their designs before the competition, which is held during the MEUS.

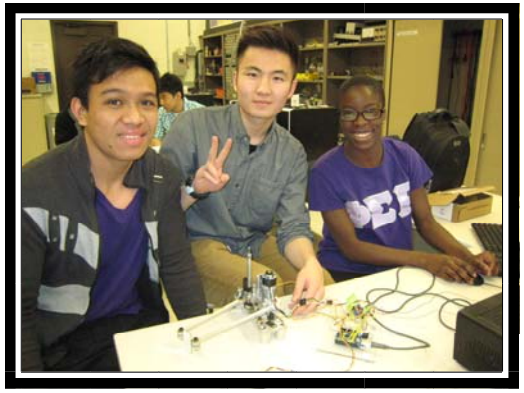
ME 350 Design and Manufacturing II

BorgWarner Galleria

1:00 PM - 3:00 PM

In ME 350, the emphasis is on the model-based design of mechanical and mechatronic systems. The students learn the design of mechanisms, the design of mechanical elements for strength, and mechatronics. Mechatronics is the synergistic integration of mechanics, electronics, control theory, and computer science within product design and manufacturing, in order to improve and/or optimize its functionality.

In the course project, students work in teams of four to design, build, and test a four-bar linkage to automatically position a mirror to reflect several laser beams onto a target. The students use a motor and transmission to move the linkage, an infrared sensor to stop the motion if an object is in the way, limit switches to calibrate the linkage position, and an encoder to keep track of the position. The students learn to program an Arduino microcontroller board (running a PID controller) to receive the signals from the sensors and make decisions based on these signals, and send the output to the motor driver to position the mirror for each firing of the lasers.



ME 450 Design and Manufacturing III

Duderstadt / Pierpont Commons

12:00 PM - 4:00 PM

ME 450 is the capstone in our unique design and manufacturing sequence. Students are taught to approach open-ended design challenges through processes, to manage and work in collaborative teams, and to synthesize and apply diverse engineering knowledge to the design and manufacturing of real mechanical systems. Teams of 4-5 students work together on a semester-long design problem, typically from industry, or faculty research, and present a working prototype at Design Expo. Students are exposed to the design process from eliciting user needs and generating concepts through to prototype validation.

ME 450 projects can be viewed in the Duderstadt and Pierpont Commons as part of Design Expo from 12:00 pm - 4:00 pm.

ME 450 Sponsors

The Mechanical Engineering Department would like to thank our Fall 2015 ME 450 project sponsors:

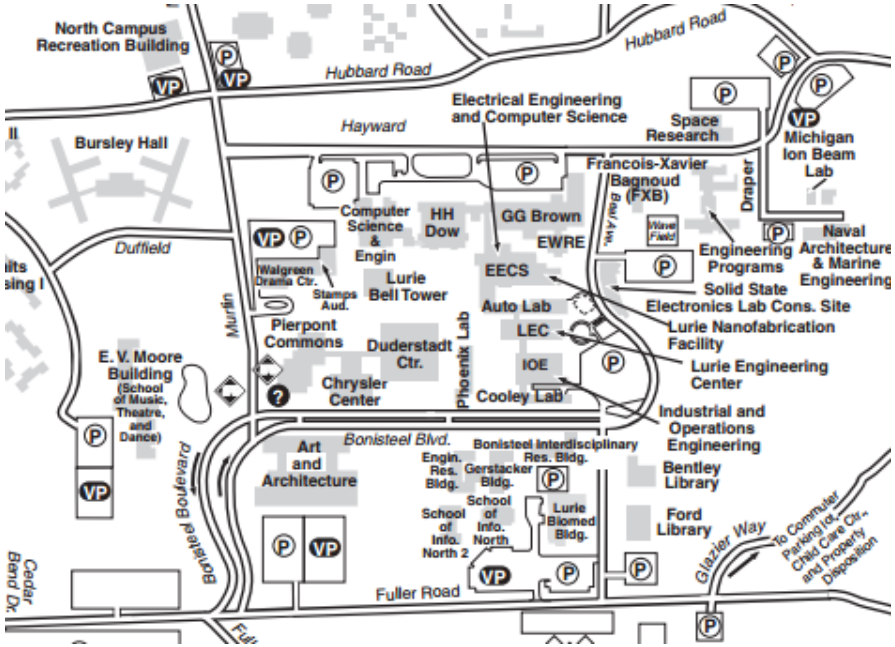
Mr. Roy Anderson
Professor Neil Dasgupta
Dr. Ben Dwamena
Dr. Grant Kruger
Coach John Paul
Ms. Nancy Senabulya
Professor Martin Strauss
Professor Roy Clarke
Mr. Steven Donoghue
Professor Brent Gillespie
Professor Mark Moldwin
Professor Johannes Schwank
Professor Kathleen Sienko
Ms. Brenda Vyletel

U-M Laboratory for Innovation in Global Health Technology
University of Michigan Central Power Plant

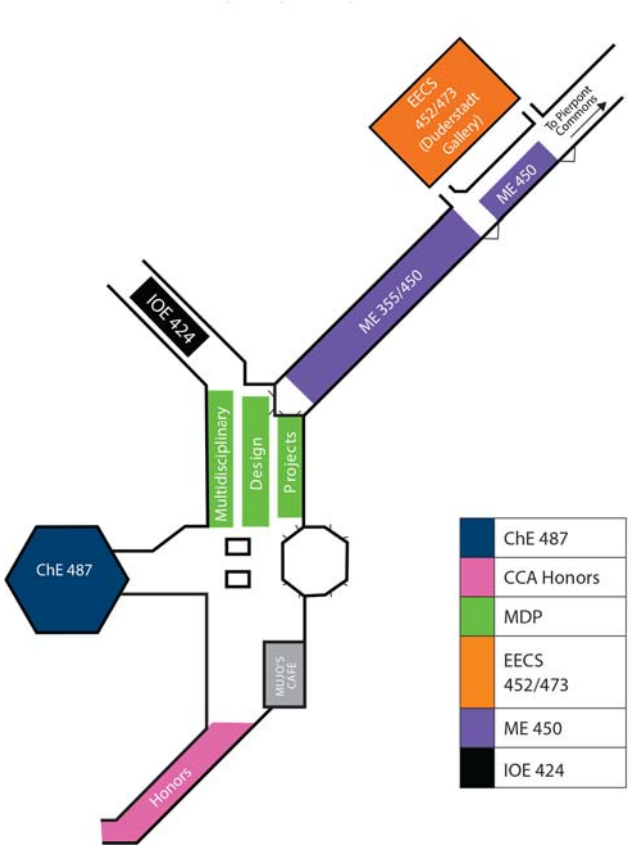
Maps

GG Brown BorgWarner Galleria

U of M North Campus



Duderstadt Center



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