

IOWA STATE UNIVERSITY

Department of Mechanical Engineering



Annual Report

2014-2015

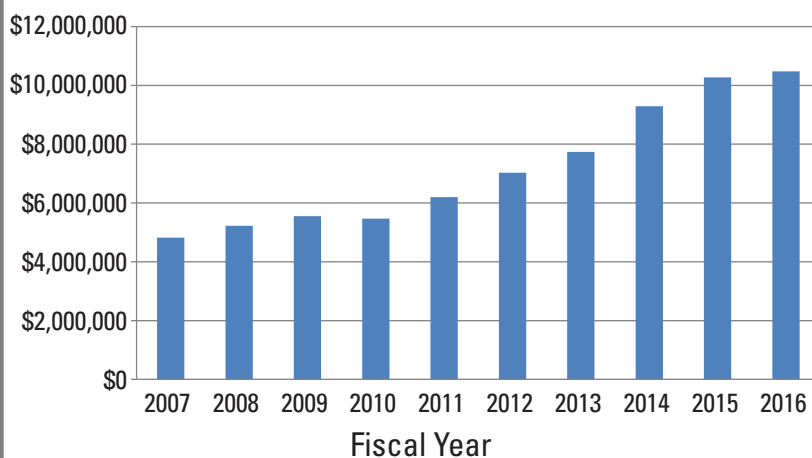
October 2015

Department Operations

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Journal Publications.....	25
Sections or Chapters in Books, Monographs, or Similar Volumes.....	32
Conference Proceedings	33

Departmental General University Budget



Personnel (Full-Time Equivalent)

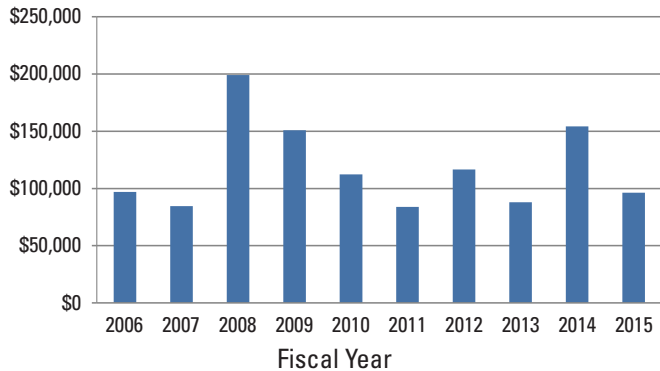
Tenure and Tenure-Track Faculty	40.86
Non-Tenure Eligible Lecturers	11.0
P&S and Merit Staff	24.8

Research Sponsors (partial list)

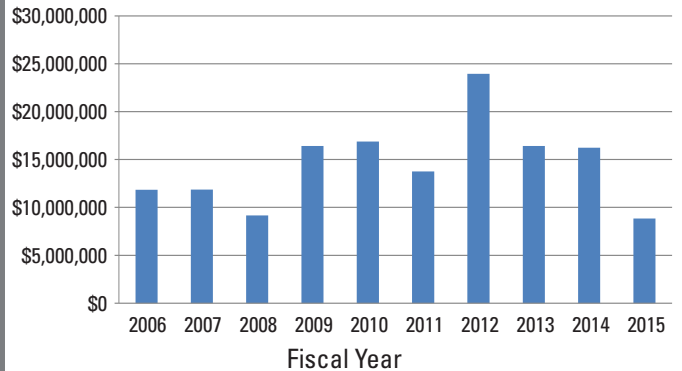
Department of Energy	Deere
USDA	Boeing
NSF	Exxon Mobil
Department of Defense	Phillips 66
NASA	SABIC Petrochemicals BV
Misc. Federal	

Cover Image: ME Design Expo,
Spring 2015, Howe Hall Atrium
Photo by Christopher Gannon

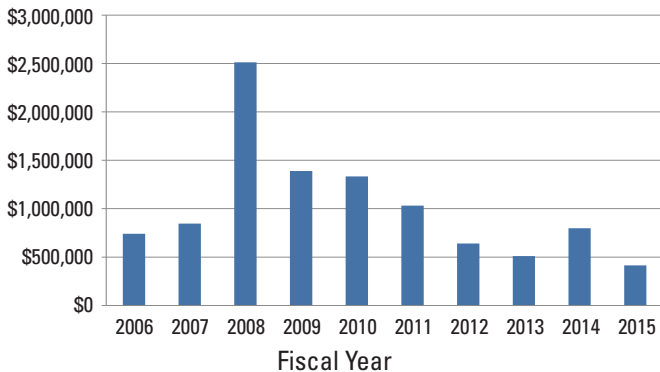
Private Giving: Black-Hilstrom Gift Production



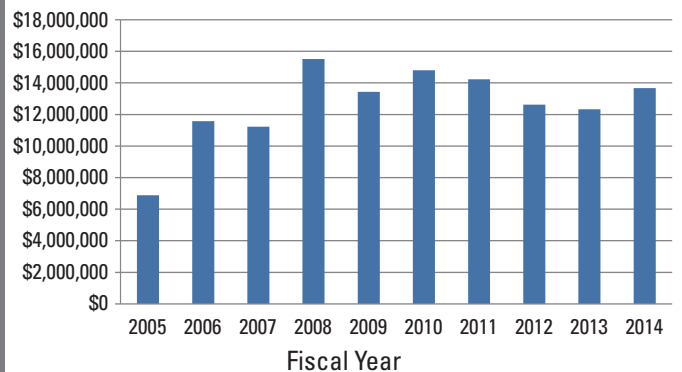
Sponsored Funding Awards Received



Private Giving: Total Gift Production



Research Expenditures



Named Faculty Positions

Anson Marston Distinguished Professor of Engineering
Robert Brown

Bergles Professor of Thermal Science
Ted Heindel

Gary and Donna Hoover Chair in Mechanical Engineering
Robert Brown

Henry Black Faculty Fellow in Mechanical Engineering
Sourabh Bhattacharya

James and Katherine Melsa Professor in Engineering
Jonathan Wickert

Joseph and Elizabeth Anderlik Professor in Engineering
Judy Vance

Larry and Pam Pithan Professor of Mechanical Engineering
Jim Oliver

Lynn Gleason Professor of Interdisciplinary Engineering
Caroline Hayes

Schafer 2050 Challenge Professor
Valery Levitas

Research

Journal Papers Published	151
Conference Papers Published	148
Sections/Chapters in Books	9
Books	3
Patents	9
Doctoral Dissertations	14
Master's Theses/Projects	14

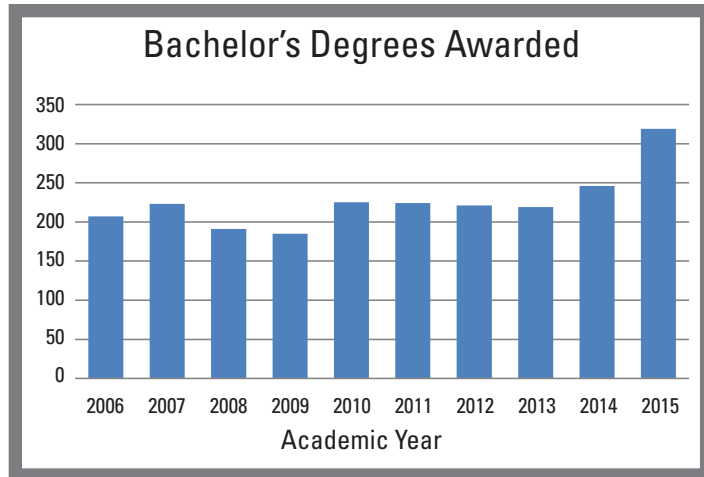
Professional Society Fellows

American Society of Mechanical Engineers

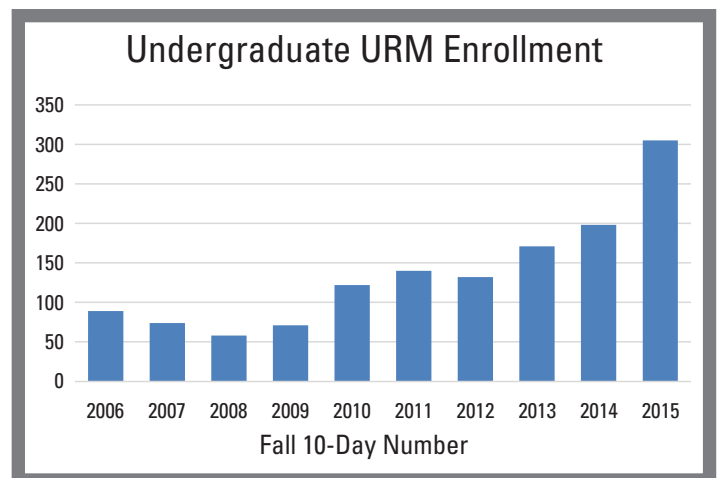
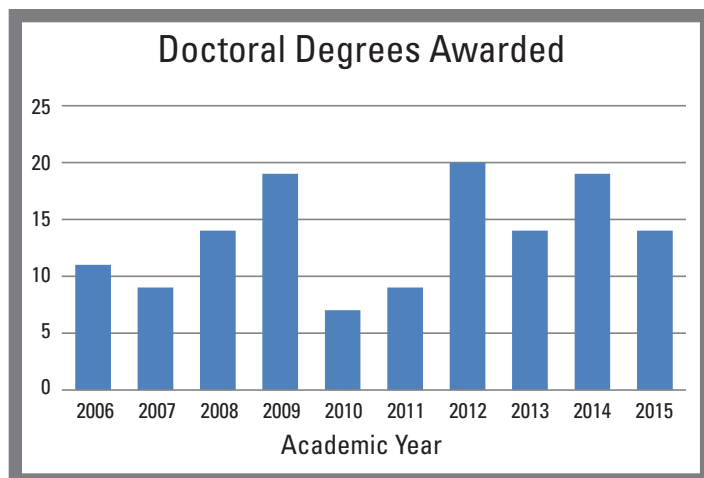
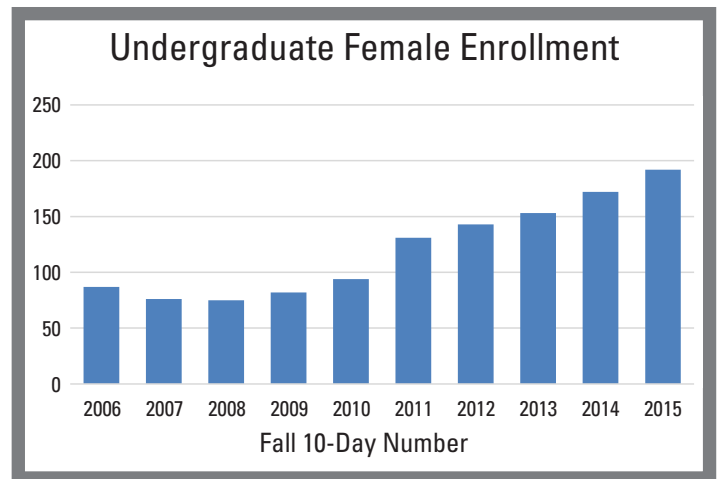
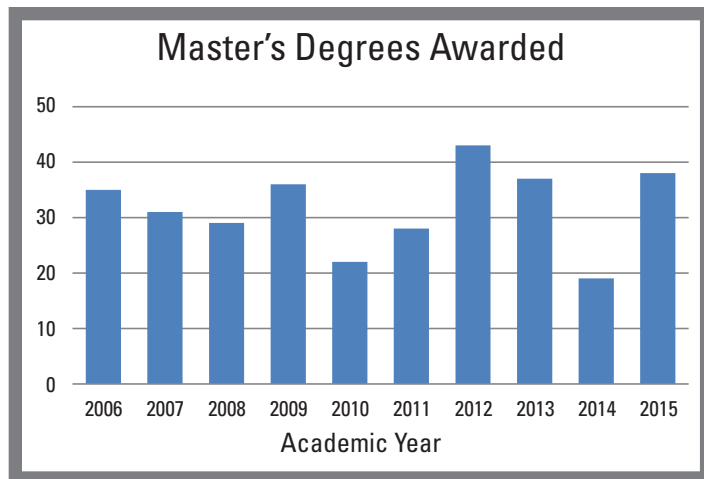
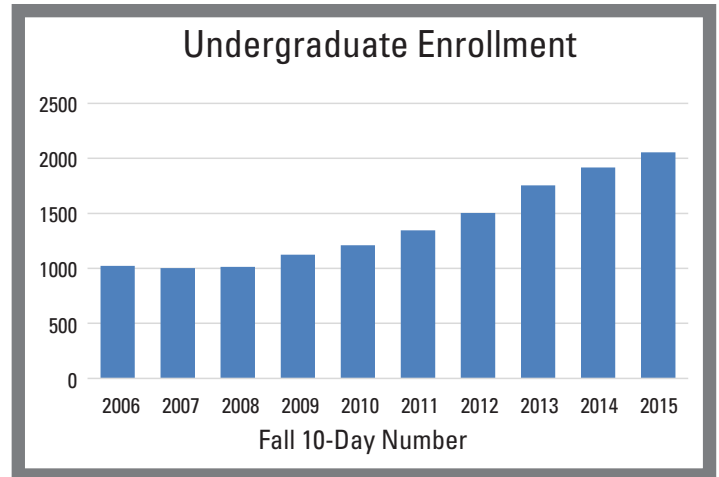
Robert Brown	Jim Oliver
Abhijit Chandra	Judy Vance
Caroline Hayes	Xinwei Wang
Ted Heindel	Jonathan Wickert
Atul Kelkar	

ME Statistics

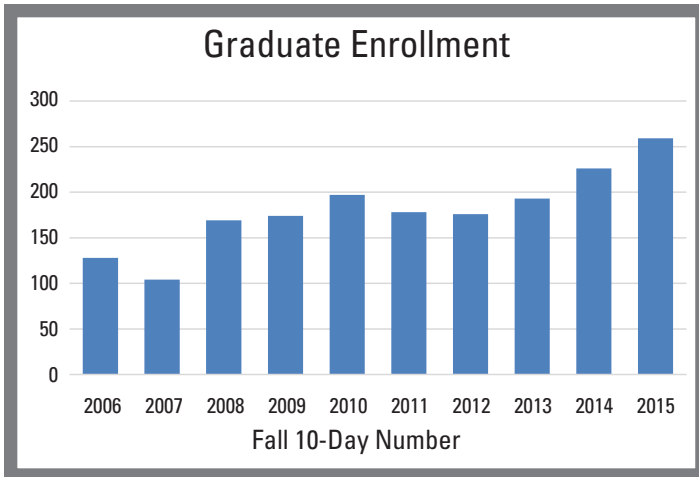
Degrees Awarded



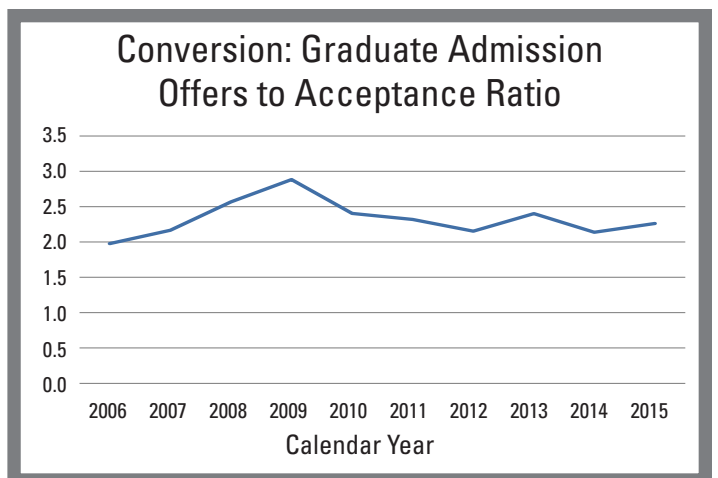
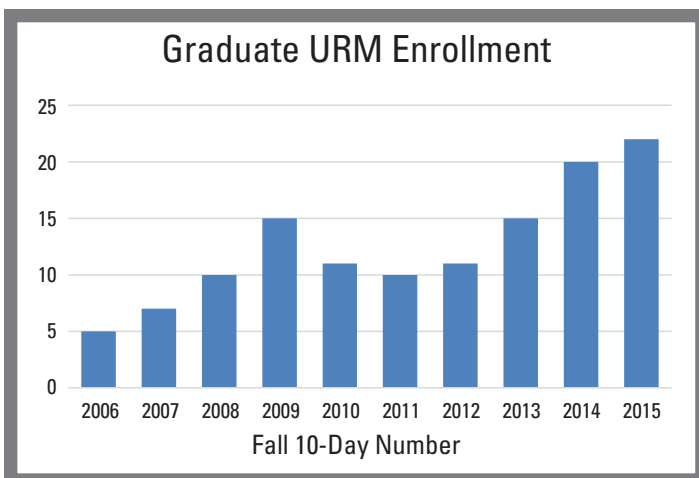
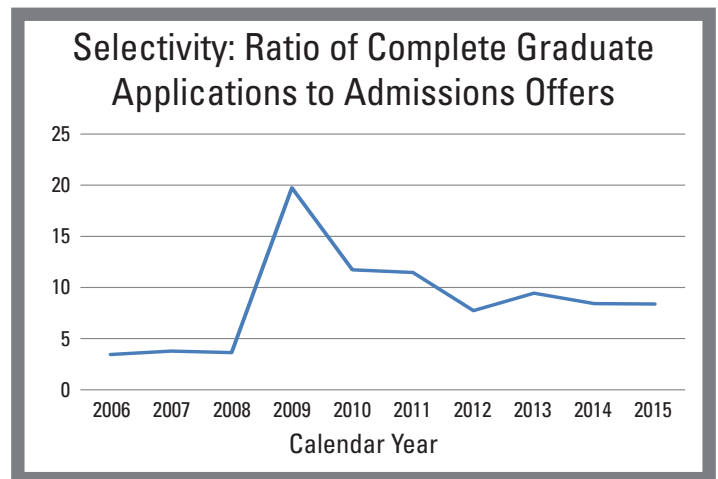
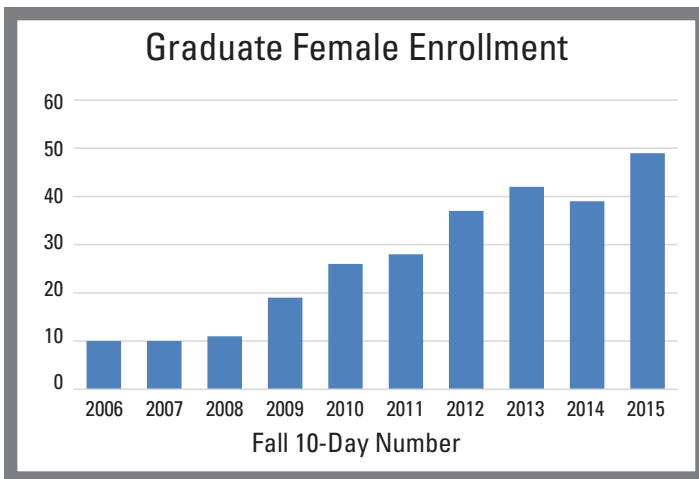
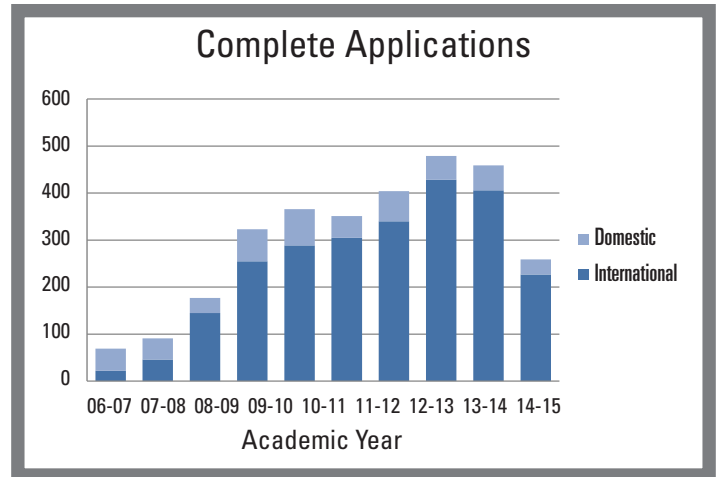
Undergraduate Enrollment



Graduate Enrollment



Graduate Program Recruitment



Undergraduate Program Highlights

Program Updates

Mechanical Engineering continues to be the largest major at ISU, with an undergraduate enrollment of over 2000 students this fall. A strong job market and the versatility of the ME degree are still fueling record enrollment growth. These long-term factors have resulted in a 70% increase in the number of undergraduate students since 2010. Even campus-wide, ISU continues to take on a greater ME 'flavor'. During ISU's explosive growth over the past five years, across nearly 150 different majors, Mechanical Engineering alone accounts for one out of every ten new students on campus! While this presents challenges to our program, it has also resulted in an enrollment of almost 200 women in our major, making them one of the largest groups of undergraduate women in ME nationally. As we address our growth, we continue our efforts at maintaining the quality of our undergraduate program, our hands-on educational experiences, and our diversity as part of our stewardship of the discipline of mechanical engineering into the future.



Cris Schwartz
Associate Chair
for Undergraduate
Studies

Recent Developments

During the past academic year, we have been proud to welcome two new advisers to the Kiewit Undergraduate Services Center. Both Jessie Vosseller and Fred Lloyd have joined us as Academic Adviser II's and they bring a wealth of knowledge from extensive pre-ISU careers, as well as their time here as undergraduate students. They, along with the rest of the staff in the Kiewit Center, are at the front lines of addressing students' needs and helping to steer our program in the face of our growth. Their dedication and expertise make our advising staff one of the best at ISU and nationally.

Senior Design Projects

ME 415 - Fall 2014

CIRAS Sponsored Projects

Hagie Manufacturing – STS Frame Stress Analysis/Redesign

- Jeff Adkins, Adam Birnbaum, Taylor Clark, Ian Jun* David Smith
- Josh DeLarm, Matthew Etheridge, Adam Lawrence*, Jesse Leonard, Peter Toy

P.M. Lattner Manufacturing Co. – Electro-magnetic Induction Water Heater

- Bryce McIntyre, Maclean Potts, Erik Rasmussen, Anthony Schimek
- Roberto Garcia, Brett Hansen, Zachary Johnson, Michael Maben

Light Ring Inc – Manhole light ring product design

- Charles Eagle, Kyle Grote, Alexander Naorniakowski, Marcus van den Aarssen
- Seth Logsdon, David Maher, Gregory Shaw, Javier Tello-Guillen

Legacy Manufacturing – Hose fitting redesign, prototype and test hose fitting

- Jeremy Gillam, Sang Soo Ha, Keenan Mahoney, Chris Shannon
- Kathryn Baringer, Taylor Geick, Matthew Meyer, Samantha Petersen, Ben Tallman

CEI Eqpmt Optimization of Feed Truck Frame Design

- Bradkley Caslavka, Eric Ho, Maria Rygh, Bryan Schiefelbein, Bryce Uitermarkt
- Brad Koester, Andrew Owens, Matt Pearson, Brandon Shearer, Jacob Smith

John Deere Ottumwa – Energy Absorption Techniques for Tractor Glass

- David Dowan, David Donahoe, Arnold Fisher, Kin Lore, Austin Wright
- Chris Basil, Brandon Gross, Kathleen Kennedy, Thanh Nguyen, Rajeendra Pemathilaka

Curries Div of Assa Abloy DG – Automatic Door Bottom for FRP Door

- Christian Kersey, Tonye Kolokolo, Brett Lyons, George Ooi, Kwang Wong
- Isaac Hanson, Jacob Mazzio, Andrew Patience, Sean Salzer, Rajat Srivastava

B&M LLC – AP Lumina – Automotive Brake Light System

- Nageswara Kadimcherla, Adam Kohl, Joshua Renner, Damon Schmidt, Curtis Thompson
- Eric Campbell, Bolin Chen, Shu An Lin, Aleksander Poniatowski

Industry Projects

Caterpillar Inc – Design of a Hydraulic Pump Case Drain Flow Monitoring System

- Eric Anderson, Charles Mollenhauer, Tyler Naberhaus, Alan Schluetter
- Adam Hamrick, Nathaniel Haut, Michael Newman, Robert Reding

Department Projects

Industrial Design Department – Bike Share Bike Lock and Tracking System

- Khalid Al Akbari, Yang Li, Kevin McCants, Mosab Osman, Nathan Witzel
- Nathan Brace, Cameron Dietrich, Marcus Graefenhain, Brian Haynes, Moon Lee

Mechanical Engineering – Smart Spring application to Vermeer T1255 Cab

- Albert Cheah, Tyler Christensen, Luke Huggins, Brendan Roth
- Callie Danielson, Amanda Hudson, Adam Jacobi, Brent Schelske

Student Club Projects

SAE ISU Chapter – SAE Formula Intake System

- Greg Bott, Nick Grady, Tyler Joes, Chad Lundberg, Derek Peters

Senior Design Projects

ENGR 466 - Fall 2014

CIRAS Sponsored Projects

Engineered Welding – *UV Energy Reclaim System*

- Adam Berquist, Houda Kji, Matt Kownick
- Matt Couri, Keith Hehring, Shengyang Wang, Letian Yang

Industry Projects

Boeing in conjunction with ISU Industrial Design – *Aircraft Galley Noise Abatement*

- Marcus Goth, Hans Heikenfeld, Tyler Langel, Lu Li, Evan Lowther, Sam Oanes, Ryan Tucker, Ben Warrick

Department Projects

Industrial Design Department – *Bike Share Bike Lock and Tracking System*

- Adam Carlson, Ken Gan, Ryan Kelly, Ryan Koll, Alessandro Modonna, Hsiang Naik

HABET (Aerospace Engineering) – *HABET Recovery Guidance System*

- Michael Huston, Jacob O'Donnell, Alex Steffen

Student Club Projects

NASA RASCAL Rover

- John Harding, Young Desanti, Zach Masters, Zach Murray, Ryan Robert, Eric Upchurch

ENGR 466 - Spring 2015

CIRAS Sponsored Projects

Cactus Jack – *E-Lite System*

- Conrad Olszewski, Eugene Leong, Jordan Fossey, Richard Ludwig, Robert Johnson
- Bohan Li, Andy Mitchell, Kyle Steen, James Yi

Department Projects

ISU Athletics – *Football Tracking System*

- Tom Wickman, Neil Akokkar, Elliot Carlson, Kevin Kauffman, Tim Marlette
- Aaron Brown, Kyle Cauwels, James Sampson, Max Smith

Agronomy – *Autonomous Rover Navigation*

- Jacob Mellams, Andrea Osberghaus, Christopher Foss, Dylan Shah, Alex Kraft, Darren Chan
- Antjuan Buffett, Anh Q. Ho, Nigel Lee, Janel Niska, Jason Renbarger, Cimone Wright

Outreach Projects

Courage League Sports – *Special Needs Sports Equipment System*

- Austin Graham, Brett Sullivan, Adrian Chan, Luis Vasconcelos Nunes
- Ryan Everly, Jesse Moehle, Alex Guetter, Daoxi Sun, Brianna Burgert

ME 415 - Spring 2015

CIRAS Sponsored Projects

AgriDrain Leader – *Multiple Roll Tile Stringing Trailer*

- Siavosh Asadi, Travis Dierickx, Jacob Fields, Dean Piscopo
- Michael Albright, Brennan Lauterbach, Chelsea Lindelof, Jacob Schultes

D & B Agro – *Grain Dryer Design Upgrade*

- Andrew Grossman, Lars Menzel, Alexander Nowysz, Daniel Ryan
- Brianne Ackerman, Andrew Atwood, Jeffrey Grenier, Joshua Wahl

Danfoss – *Danfoss Cradle Bearing Test Rig*

- Joel Becklund, Seth Berry, Matt Dirks, Kaitlyn Garon, Matthew Gulleen, Katelyn Stangl
- Anne Carstensen, Dustin Monat, Theresia Ohms, Joseph Reinert, Teshia Robinson

Hach Industries – *Fluid Transfer Work Station Automation*

- Steve Carstens, William Frank, Troy Heims, Moye Li, Mitchell Wittman
- Kyle Collins, Alex Kubiak, Vincent Lee, Steven Linder, Joshua Meyer

PM. Lattner Manufacturing Co. – *Electro-magnetic Induction Water Heater*

- Azzam Alnasser, Muhamad Hazemi, Nicholas Krahenbuhl, Patrick McDermott
- Theodore Marth, Trevor Maunu, Ter Ng, Mark Taibleson

Legacy – *High pressure swivel fitting design*

- Gregory Davis, Jesse Dopita, Samuel McGuire, Aaron Oltmann, David Omestad
- Jordan Firnbach, Brian Ortiz, Ethan Schroeder, Austin Wolf, Eric Wos

Liguria Foods – *Food Handling Automation System*

- David Bromeier, Nicholas Grossmann, Charles Haley, Yinyu Pei, Jeremy Price
- Matthew Kilworth, David Litchfield, Joshua Piske, Hans Schaeffer, Gavin Smith

Linden Propeller – *Propeller straightening/calibration system*

- Suya Gao, Justin Graeve, Elijah Jans, Jason Kreterfield, Patrick Schueller
- Peter Korff, Skyler Marquis, Jonathan Treichler, Matthew Wyatt, Peitao Yang

Molded Products – *Catheter cap/clamp design*

- Robert Real, Peter Taylor, Kyle Wildman, Jun Woon, Yuanhan Xu
- Neal Fredrick, Lauren Kokos, Christian Mellett, Estefania Quintas Colmenares, Scott Reithmeier

Paragon International – *Outer Kettle Temperature Reduction*

- Connor Henkle, Xiguang Lv, Samuel Mereness, Marcus Thomas, Derek Tigges
- Joseph Borts, Christopher Carlson, Bolin Chen, Lucas Powers, Daniel Scott, Kyle Vols

Industry Projects

Caterpillar – *PCOM Infrared Tire Heater System*

- Dakota Morgan, Jonathan Pulse, Ryan Vanderhoff-Yarbrough, Nick Vogel, Matthew Anderson, Ryan Freiling, Ethan Orth, Alex Steffen

Department Projects

Agronomy Department – *Autonomous Rover*

- Garrett Clappitt, Mansour Mancini, Sam Nerem, William Rosenberg, Dennis Thomas
- Matthew Fucik, Marcus Herrera, Katherine Krettek, Abhishek Seshappa, Gavin Young

Biocentury Research Farm – *Mobile Algal Culture System*

- Benjamin Colton, Brok Dawley, Layton Flynn, Colton Lindemann, Taylor Williams
- Logan Danko, Nicholas Kron, Caleb Rook, Garrett Simpson, Emily Whitemarsh

Industrial Design Department – *Bike Share Prototypes*

- Anthony Civitate, Nathan Erickson, Kevin O'Brien, Cody Rickard, Macen Van Allen
- Joshua Burke, Kyle Cauwels, Richard Matthews, Kyle McNab, Seth Meyer

Mechanical Engineering – *Biodiesel Fuel Blender*

- Kevin Diverde, Ely Helling, Casey Ristau, Michael Strawn, Matthew Swanson

Student Club Projects

NASA RASCAL Habitat

- Katelyn Emig, Abbey Machtemes, Toan Nguyen, Garrett Schieber, Robert Ter-muhlen

* Denotes Team Leader

Graduate Program

Highlights

By the end of the 2014-2015 academic year, mechanical engineering had 220 student enrolled. The department granted 14 Master's of Engineering degrees, 14 Master's of Science degrees, and 10 Doctorate degrees during the fall and spring semesters.

Recent Developments

The Mechanical Engineering office has recently undergone a couple of personnel changes. Kristin Clemens was hired in November 2014 as the Graduate Programs Assistant. Dr. Song-Chang Kong was appointed as the Director of Graduate Education effective July 1st, 2015.

During summer 2015, the Mechanical Engineering department hosted fifteen undergraduate students as part of the Microscale Sensing Actuation and Imaging (MoSAlc) Research Experience for Undergraduates (REU). This was the programs biggest class yet!

The department provides several professional development opportunities to graduate students in technical writing, presentation, and networking. Beginning in 2015, the department has implemented a program to enhancing the technical writing of graduate students and post-doctoral researchers. The department supports two discipline writing consultants, who are seasoned ME doctoral students trained in technical writing, to help graduate students with the organization, overview, and style of the manuscripts. After a manuscript is finished, the students will meet with English writing consultants, who are experienced editors and can help improve the English writing pattern and recurring mistakes in a manuscript.

In the meantime, the department also works with the ME Graduate Student Organization in helping the graduate students adapt to the life on campus. Numerous workshops in enhancing the presentation skills are hosted. Additionally, a number of networking and social activities and industrial tours are also organized throughout the year.



Song-Chang Kong
Associate Chair
for Graduate Studies
Director of Graduate Education

Doctoral Dissertations

David Asjes

Dissertation: Nonlinear analysis of a two- and three-degree-of-freedom aeroelastic system with rotational stiffness free-play
Faculty mentor: Atul Kelkar

Karl Broer

Dissertation: Partitioning of fuel bound nitrogen in biomass gasification
Faculty mentor: Robert Brown

†† Tristan Brown

Dissertation: Quantifying the economic competitiveness of cellulosic biofuel pathways under uncertainty and regional sensitivity
Faculty mentors: Mark Mba Wright and Guiping Hu (IMSE)

Marisol Martinez Escobar

Dissertation: Human Factors and performance considerations of visual spatial skills in medical context tasks
Faculty mentor: Eliot Winer

David Escudero

Dissertation: Characterization of the hydrodynamic structure of a 3D acoustic fluidized bed
Faculty mentor: Ted Heindel

Benjamin Halls

Dissertation: X-ray radiography and fluorescence for liquid distribution and mixing measurements in impinging jet sprays
Faculty mentor: Terry Meyer

Kenneth Kopecky

Dissertation: A software framework for initializing, running, and maintaining mixed reality environments
Faculty mentor: Eliot Winer

Viksit Kumar

Dissertation: Using speckle statistics to improve attenuation estimates for cervical assessment
Faculty mentor: Timothy Bigelow

Katrine Nilsen

Dissertation: Numerical and experimental investigation of turbulence and transport in mixing geometries
Faculty mentor: Michael Olsen

Ryan Pavlik

Dissertation: Enabling natural interaction for virtual reality
Faculty mentor: Judy Vance and Miller (COM S)

§ Punit Tulpule

Dissertation: Integrated Robust Optimal Design (IROD) via sensitivity minimization
Faculty mentor: Atul Kelkar

†† Haoyu Wang

Dissertation: Experimental and numerical study of Taylor-Couette flow
Faculty mentor: Michael Olsen

§ Kaige Wang

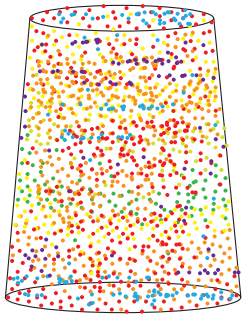
Dissertation: Pyrolysis and catalytic pyrolysis of protein- and lipid-rich feedstock
Faculty mentor: Robert Brown

§ Yu Xie

Dissertation: A computational framework for solving coupled equation systems using finite element method and introduction to a versatile fault-tolerant toolkit for high throughput batch processing
Faculty mentor: Baskar Ganapathysubramanian

§ Research Excellence Award
†† Teaching Excellence Award

Research Portfolio



Biological and Nanoscale Sciences

The biological and nanoscale sciences program investigates problems at the interface of engineering, biology, and nanotechnology, allowing us to apply the fundamental principles of mechanical engineering to expand opportunities for new science and engineering breakthroughs. Several faculty members have focused their research efforts in this area. Professor Xianglan Bai is conducting research projects about understanding fundamentals of fast pyrolysis and improving stability of bio-oil, as well as conversion of municipal solid waste to biofuels.

Clean Energy Technologies

The clean energy technologies program investigates alternative energy, energy efficiency, and advanced processes and materials that have reduced resource demand and environmental impact.

Associate professor Daniel Attinger is the leader of a collaborative project between engineers and plant scientists to develop computationally engineered plants that could have the same kind of impact on agriculture as biomedical engineering has had on medicine. Baskar Ganapathysubramanian, assistant professor, is working on the project to develop computer models of how the environment affects a plant's nutrient transport, water uptake, photosynthesis and root architecture.

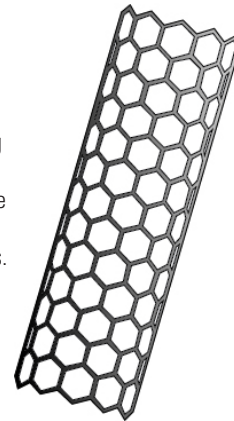


Complex Fluid Systems

The complex fluids system program investigates flows that are non-Newtonian, multiphase, turbulent or chemically reacting. ME faculty in complex fluids systems are developing unique experimental and computational techniques that advance our understanding of fluid flow phenomena and enable engineering applications, including droplet splash in forensic applications; applications of nanomaterials in heat transfer; fuel and chemical production in multiphase reactors; biomass transport and conversion to fuel; virtual engineering in immersive environments; biosensors; particle dispersion; uncertainty quantification; microfluidics; fluid-structure interaction; energy systems analysis; combustion; energetic materials; and heat exchangers in evaporators, boilers, and condensers. The group of faculty working in this area are: Daniel Attinger, Xianglan Bai, Ganesh Balasubramanian, Robert Brown, Mark Bryden, Jonathan Claussen, Sebastian Feve, Baskar Ganapathysubramanian, Matt Hagge, Nastaran Hashemi, Ted Heindel, Ming-Chen Hsu, Atul Kelkar, Song-Chang Kong, Mark Mba Wright, Mike Olsen, Alberto Passalacqua, Travis Sippel, Shankar Subramaniam, and Xinwei Wang. This year the College of Engineering awarded an Accelerating Collaborative Research Initiative award to CoMFRE: a collaborative group of faculty engaged in multiphase flow research and education.

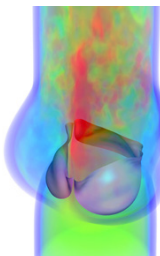
Design and Manufacturing Innovation

The design and manufacturing innovations (DMI) program centers on transforming resources into useful and desirable products cutting across all phases of the design and manufacturing cycle. Novel experimental, computational, and analytical techniques are developed to advance our understanding of these transformation processes, as well as to study practical applications of the fundamental science. Faculty members in the DMI program have been actively involved in various research areas, which include advanced multi-physics and hybrid manufacturing, sustainable design of products, chemical mechanical polishing of wafers, virtual manufacturing, manufacturing automation, and advanced composite materials. The manufacturing laboratories of DMI program continuous to get better by newly adding a materials testing system and several hardness testing machines. In addition, a Dean's Education Initiative was awarded to the manufacturing program to improve student hands-on learning experiences and to accommodate large class sizes in labs.



Simulation and Visualization

ME faculty members in Simulation and Visualization Program have found rich applications in biomedical areas. Ming-Chen Hsu has developed a robust, accurate and efficient computational framework to simulate the function of a heart valve over a complete cardiac cycle under realistic physiological conditions. This will allow researchers to study hemodynamics and cyclic stresses developed in the leaflets and develop new bio-prosthetic heart valves with improved performance and durability. Adarsh Krishnamurthy also conducts computational modeling of heart failure. These advanced computational models, developed from patient-specific clinical data, can help refine the diagnosis and personalize heart failure intervention therapies. His research was used to ascertain a possible mechanism for improvement due to cardiac resynchronization therapy for the first time. This investigation suggests the possibility of extracting important diagnostic information from clinical measurements using computational models.



Dynamic Systems, Sensors, Control

ME faculty in Dynamic Systems, Sensors, and Control area conduct fundamental and applied research on the analysis, measurement, monitoring and control of complex dynamical and structural systems, including development of new analytical, computational and experimental tools, and novel applications to engineered and natural systems. The spectrum of research applications that ME faculty work in include aerospace systems, robotics, control of noise and vibrations, big data analytics and decision making, micro and nano systems, and energy technologies. The group of faculty working in this area are: Atul Kelkar, Greg Luecke, Soumik Sarkar, Sourabh Bhattacharya, Juan Ren, and Shan Hu. The research conducted by this group also spans wide spectrum of sponsors from state and federal agencies to small and large industries.

Department Organization

Faculty



Emmanuel Agba
Senior Lecturer

PhD, Mechanical Engineering, Florida Atlantic University
M Eng, Mechanical Engineering, University of Benin, Nigeria
B Eng, Mechanical Engineering, University of Benin, Nigeria

Interests: Product realization, product lifecycle management, virtual manufacturing engineering, computer-aided engineering



Daniel Attinger
Associate Professor

BE and MS, Mechanical Engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, 1997
Sc D, Technical Sciences, Eidgenössische Technische Hochschule (ETH) Zurich, Switzerland, 2001

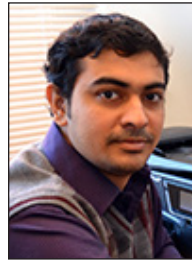
Dr. Attinger's research interests include micro and nanofluidics, convective heat transfer, single droplet/bubble dynamics, visualization, engineering and simulation of multiphase flow, and multiscale transport phenomena for energy and forensics applications.



Xianglan Bai
Assistant Professor

BS, Aerospace Engineering, Beijing University of Aero. & Astro., China
MS, Aerospace Engineering, Beijing University of Aero. & Astro., China
PhD, Mechanical Engineering, The University of Tokyo, Japan

Dr. Bai's research interests include bio-fuels and bio-based products, thermochemical conversion of biomass and other waste streams and fast pyrolysis and solvent liquefaction.

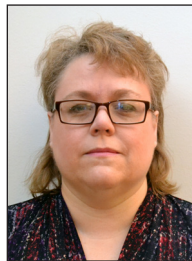


Ganesh Balasubramanian
Assistant Professor

BS, Mechanical Engineering, Jadavpur University, Kolkata, West Bengal, India, 2007

PhD, Engineering Mechanics, Virginia Polytechnic Institute and State University, 2011

Research interests: nanoscale transport phenomena, surface modifications through photoswitchable polymers, development and implementation of multiscale computation techniques, and predicting mechanical properties of soft matter and synthetic (bio)materials.



Jackie Baughman
Senior Lecturer

Ph.D. Industrial & Agricultural Technology and Biorenewable Resources & Technology, Iowa State University, 2012

MBA Business Administration. Keller Graduate School of Management, 1997

B.S. Metallurgical Engineering. Iowa State University, 1989



Sourabh Bhattacharya
Assistant Professor
Henry Black Faculty Fellow in Mechanical Engineering

B. Tech., Indian Institute of Technology, Bombay, 2002

M.S.E.E., University of Illinois, Urbana-Champaign, 2005

M.S., Applied Mathematics, University of Illinois, Urbana-Champaign, 2009

PhD, Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, 2010

Dr. Bhattacharya's research interests include optimal control theory, game theory, robotics, compressed sensing, large data storage and inference, security for cyber-physical systems, networked control systems, and machine vision.



Timothy Bigelow
Associate Professor, Mechanical Engineering and Electrical and Computer Engineering

BS, Electrical Engineering, Colorado State University, 1998
MS, Electrical Engineering, University of Illinois at Urbana-Champaign, 2001
PhD, Electrical Engineering, University of Illinois at Urbana-Champaign, 2004

Professor Bigelow researches systems that use ultrasound in treating cancer, quantifying physical properties of tissue using back-scattered ultrasound signals, applying ultrasound to treat infections, and exploring ultrasound-induced bioeffects for ultrasound safety and therapy applications.



Robert Brown
Anson Marston Distinguished Professor Gary and Donna Hoover Chair in Mechanical Engineering
Director, Bioeconomy Institute
Director, Center for Sustainable Environmental Technologies

BS, Physics, University of Missouri, 1976
BA, Mathematics, University of Missouri, 1976
MS, Mechanical Engineering, Michigan State University, 1977
PhD, Mechanical Engineering, Michigan State University, 1980

Professor Brown studies the conversion of biorenewable resources into bioenergy and biobased products, combustion, gasification, fast pyrolysis, hydrogen energy, hydrodynamics, and heat transfer in fluidized beds.



Mark Bryden
Associate Professor

BS, General Engineering, Idaho State University, 1977
MS, Mechanical Engineering, University of Wisconsin, Madison, 1993
PhD, Mechanical Engineering, University of Wisconsin, Madison, 1998

Professor Bryden researches the virtual engineering of fluids and heat transfer systems within collaborative, immersive, and synthetic environments.

Faculty Highlights

Emmanuel Agba continued to serve as faculty adviser to Team PrISUm, which won the best mechanical design award and placed third in the 2014 American Solar Challenge and Formula Sun Grand Prix. Iowa State University hosted a check point during the race.

Daniel Attinger led the ISU working group on computationally engineered plants, which features 8 faculty members from the Colleges of Life Sciences and Agriculture (3) and the College of Engineering (5). The team received one out of seven Award from the Iowa State President Steven Leath, in his university-wide initiative for Interdisciplinary Research. Attinger also chaired the 2014 ICNMM conference of the American Society of Mechanical Engineers in Chicago, and was visiting Professor at Tsinghua University, in Beijing.

Xianglan Bai received three new research grants and renewed two grants. She published seven journal papers and one accepted paper, one book chapter and 11 conference presentations. A corresponding author article was chosen as "American Chemistry Society Editor's Choice."

In addition to publishing papers, introducing new courses in the ME curriculum and constructing a research program on computational nanoscience and materials modeling, **Ganesh Balasubramanian** was awarded an NSF grant as the PI to establish a simulation-experiment hybrid design framework for defect engineered nanomaterials.

Jackie Baughman was the proposal developer and project team lead for the ISU Online Learning Innovation Hub: hybrid course development for ME's chain of four design courses. She also worked on the BRT graduate program FY2014 expansion through course development and fellowships largely due to leading the Bioeconomy funds provided by the State of Iowa, and leveraging this to secure additional EPSCoR funding.

Robert Brown serves as director of the Bioeconomy Institute at ISU, which conducted \$11 million in research in 2014. He and his collaborators published 27 peer-review papers this past year. The second edition of his textbook Biorenewable Resources was released early in 2014.

In 2014 **Mark Bryden** helped found and launch AgSolver™ Inc. based on environmental modeling algorithms and techniques developed in his research laboratory. AgSolver™ is an agronomic decision services company whose products are focused on improving land management decisions, simplifying mandatory compliance and reporting activities, and maximizing returns for agricultural land investments. AgSolver™ is a spin off of Praxik LLC, which was founded in 2013 based on technology developed in Professor Bryden's research group.



Abhijit Chandra
Professor

BTech, IIT, Kharagpur, India, 1978
MS, University of New Brunswick, Canada, 1980
PhD, Cornell University, 1983

Professor Chandra's research interests include mechanics of manufacturing processes, nanoscale surface modification, multiscale and multiphysics modeling, renewable energy, and the boundary element method.



Jonathan Claussen
Assistant Professor

PhD, Biological Engineering, Purdue University, 2011
MS, Mechanical Engineering, Purdue University, 2008
BS, Mechanical Engineering, University of Minnesota, 2006
BA, Spanish and Portuguese Studies, University of Minnesota, 2006

Professor Claussen's research interests include biosensors (electrochemical and optical, bio-integrated electronics, BioMEMS and BioNEMS, micro/nanoscale propulsion, carbon nanomaterial growth)graphene and carbon nanotubes, nanomanufacturing / materials printing, quantum dots / carbon dots, and mass transport / fluid dynamics.



Sebastien Feve
Senior Lecturer

MS, Mechanical Engineering, Ecole Nationale d'Ingenieurs de Metz, France, 1998

Interests: Tire research, fundamentals of thermodynamics, engineering education, international & study abroad opportunities.



Baskar Ganapathysubramanian
Associate Professor

BTech, Indian Institute of Technology, Madras, Mechanical Engineering, 2003
MS, Cornell University, Mechanical and Aerospace Engineering, 2006
PhD, Cornell University, Mechanical and Aerospace Engineering, 2008

Professor Ganapathysubramanian researches computational physics, computational mechanics (fluid mechanics and heat transfer), stochastic analysis, uncertainty quantification and propagation, multiscale modeling, control and optimization of complex systems, materials-by-design, and parallel computing and inverse problems.

Faculty Highlights

Abhijit Chandra's work on multi-physics simulation of chemical mechanical planarization continues to be used by several industries. Based on his group's research, hip implant life expectancies are enhanced by Aeculap AG of Germany. Work on enhancing life expectancy of wind turbine gear boxes was initiated in collaboration with Nanjing Tech. University and Nanjing Gongda CNC Machine Tools Co. of China.

Jonathan Claussen has established research collaborations with faculty from Texas A&M University, University of Florida, Brigham Young University, as well as Iowa State University and has acted as a committee member and session chair for SPIE Defense, Security, & Sensing Conference in Baltimore, MD. Jonathan has laid the groundwork to use and develop interactive, online teaching programs for ISU undergraduate students in ME 160 and for high school students in the Young Engineers and Scientist (YES) Program who perform research at ISU. He has also initiated outreach activities with the Des Moines Hoover High School where he will visit with students and encourage students, in particular underrepresented minorities, to pursue college education and careers in the STEM fields.

Sebastien Feve wrote the winning proposal for Hybrid Instruction of ME170, ME270, ME415, ME466 from the CELT Online Innovation Hub in collaboration with Jackie Baughman, Gloria Starns, Matt Hagge and Josh Mineroff. He also organized and led a presentation & panel discussion event for 300+ ME freshman students to "Internationalize the Freshmen Experience in ME170". Guest speakers and participants were from the College of Engineering, the World Languages/LCP program, the COE International Office and John Deere.

Baskar Ganapathysubramanian was selected as PSI faculty Fellow, was selected as a US NAS run Arab-American Frontiers of Science, Engineering and Medicine attendee, and his research work was highlighted as cover page on 'Lab-on-a-chip'.



Matt Hagge
Senior Lecturer

PhD, Mechanical Engineering, Iowa State University, 2005
MS, Mechanical Engineering, Iowa State University, 2002
BS, Mechanical Engineering, Iowa State University, 1998

Interests: Computational modeling, wood, combustion, pyrolysis, thermodynamics, and visualization of bloodstain pattern analysis



Nastaran Hashemi
William March Scholar in Mechanical Engineering
Assistant Professor

BS, Mechanical Engineering, Tehran Polytechnic, 1999
MS, Mechanical Engineering, West Virginia University, 2004
PhD, Mechanical Engineering, Virginia Tech, 2008

Dr. Hashemi's research areas of interest include microfluidics, biosensors, optofluidics, Bio-N/ MEMS: design, modeling, and fabrication, diagnostics and therapeutics, physics of micro/ nanoscale phenomena, and nonlinear dynamics.



Caroline Hayes
Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

PhD, Robotics, School of Computer Science, Carnegie Mellon University, 1990
MS, Knowledge-Based Systems, Mellon College of Science, Carnegie Mellon University. Interdisciplinary degree between Psychology, Computer Science and Mechanical Engineering, 1987
BS Computer Science, Carnegie Mellon University, 1983

Dr. Hayes's recent focus is on understanding the sociotechnical factors impacting collaboration in globally distributed design teams, and in developing processes and tools to make such teams more effective. Her research has crossed disciplinary boundaries between engineering, psychology, computer science and management.



Ted Heindel
Bergles Professor of Thermal Science

BS, Mechanical Engineering, University of Wisconsin, Madison, 1988
MS, Mechanical Engineering, Purdue University, 1990
PhD, Mechanical Engineering, Purdue University, 1994

Professor Heindel works with x-ray flow visualization, fluid mechanics, multiphase flow hydrodynamics, and gas-liquid mass transfer.



Jim Heise
Senior Lecturer

MS, Mechanical Engineering, Iowa State University
BS, Mechanical Engineering, Iowa State University
AS, Mechanical Engineering Technology, Hawkeye Community College

Interests: Product design engineering, project management, design for Lean Sigma®/Six Sigma®

Matt Hagge established a new pedagogy called Decision Based Learning. He produced a tutor that provides very rapid rates of improvement in student understanding. Matt is working to actively publish this pedagogy and its potential for learning, improved instruction, and outcome (ABET, state, etc) evaluation.

Nastaran Hashemi delivered two keynote presentations both nationally and internationally. Her collaborative work was highlighted by many news agencies such as Fox News, Phys.org and Science News.

Ted Heindel published his first book in 2014, entitled "An Introduction to Bioreactor Hydrodynamics and Gas-Liquid Mass Transfer." He also leads the Iowa NSF EPSCoR project and led a successful reverse site visit to NSF where the entire project was positively reviewed by a 13-member panel. Ted is also the Director of Graduate Education for the Masters of Engineering Degree in Energy Systems Engineering, which is a new program that was approved by the Board of Regents in 2014.

Jim Heise was promoted to Senior Lecturer in Mechanical Engineering. Jim continues serving the department as Design Projects Coordinator. 43 projects were selected for the ME Capstone Senior Design Program spread over 71 teams; 27 of these projects were in direct support of Iowa manufacturers and cosponsored by CIRAS. Economic impact of these projects is being tracked by CIRAS and is estimated to be potentially in the millions of dollars. Jim continues to serve as faculty advisor to the ISU Lunabotics Club who had another remarkable year winning the autonomy award at the 5th Annual NASA Robotic Mining Competition at the Kennedy Space Center.

Faculty Highlights

Ming-Chen Hsu has been developing novel computational methods for fluids, structures and fluid-structure interaction applied to contemporary engineering problems such as wind turbine and heart valve analysis. He has published six journal papers and two book chapters. His articles received 783 citations based on Google Scholar in 2014.

Shan Hu is establishing a laboratory for experimental research on nanomaterials for energy storage and energy harvesting. Lab capabilities being established include materials synthesis, device fabrication, and performance characterization.

Atul Kelkar was awarded a US Patent in the area of conversion of hazardous waste hydrocarbons into usable fuels. He is contributing to K-12 STEM education by developing an innovative educational video games based on his years of experience in aerospace research. His contributions were featured in AIAA's newsletter which is read worldwide. Dr. Kelkar published a NASA Paper jointly with NASA Senior Scientist on the control of asteroid capture spacecraft. His entrepreneurial efforts have not only led to positive economic impact and job creation for the state but have also benefited engineering faculty at Iowa State through research subcontracts through DoD STTR grants. He also held leadership position in organization of key conference of Dynamic Systems and Control Division of ASME. He is Fellow of ASME and Associate Fellow of AIAA.

Song-Chang Kong conducts innovative research in multiphase flows and renewable energy systems. His group has developed high-fidelity computational framework for simulating biomass thermochemical conversion for biofuel production. He has developed highly-efficient optimization algorithms for diesel engine performance optimization. He also collaborates with Army Research Laboratory on investigating the fundamentals of diesel spray atomization, mixing, and fuel drop interactions with pistons for military applications. He is an associate editor for ASME Journal of Engineering for Gas Turbine and Power, associate editor for Frontiers in Mechanical Engineering, and a member in the editorial board of Internal Journal of Engine Research.

Part of **Adarsh Krishnamurthy's** research in 2014 focused on computational modeling of heart failure, where identifying patients who will best respond to a particular therapeutic intervention is difficult. Computational models, developed from patient-specific clinical data, can help refine the diagnosis and personalize heart failure intervention therapies. His group's research has recently been used to ascertain a possible mechanism for improvement due to cardiac resynchronization therapy, which uses implantable pacemakers to synchronize ventricular function, for the first time. This preliminary investigation suggests the possibility of extracting important diagnostic information from clinical measurements using computational models.



Ming-Chen Hsu
Assistant Professor

BS, Engineering Science and Ocean Engineering, National Taiwan University, 2003
MS, Engineering Science and Ocean Engineering, National Taiwan University, 2005
MSE, Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin
PhD, Structural Engineering, University of California, San Diego, 2012

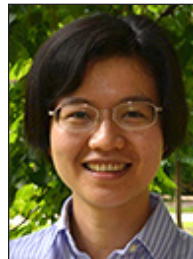
Dr. Hsu's research interests lie in the field of Computational Mechanics, Isogeometric Analysis and Fluid-Structure Interaction (FSI) with an emphasis on contemporary engineering problems such as wind energy and biomedical applications.



Chao Hu
Assistant Professor

Ph.D., Mechanical Engineering, University of Maryland, College Park, MD, 2011
B.E., Engineering Physics, Tsinghua University, China, 2007

The goal of Dr. Hu's research is to develop innovative engineering design and failure prognostics methodologies that lead to design of resilient and sustainable systems.



Shan Hu
Assistant Professor

Ph.D., University of Minnesota, Minneapolis, MN, 2014
M.S., University of Minnesota, Duluth, MN, 2009
B.S., Harbin Institute of Technology, Harbin, China, 2007

Selected research interests: Nanomaterials for energy storage and energy harvesting; scalable manufacturing of nanomaterials-based devices; sensors, actuators, and controls



Jaime Juarez
Assistant Professor

Johns Hopkins University, Ph. D., Chemical and Biomolecular Engineering, 2011

The University of Texas at San Antonio, M. S., Mechanical Engineering, 2006

Stanford University, B. S., Mechanical Engineering, 2004

Areas of interest: Microfabrication, Microscopy, Microfluidics, Flow Cytometry, Soft Matter Physics, Self Assembly of Materials, Physics of Micro- and Nanoscale Forces, Simulation of Colloidal Materials



Atul Kelkar
Professor

BS Mechanical Engineering, University of Poona, Pune, India, 1984

MS, Mechanical Engineering, Old Dominion University, Norfolk, VA, 1990

PhD, Mechanical Engineering, Old Dominion University, Norfolk, VA, 1993

Professor Kelkar researches control theory, robust and nonlinear control, acoustic noise control, vibration control, flexible multibody dynamics, integrated design via multiobjective optimization, robotics, and neural networks.



Gap-Yong Kim
Associate Professor

BS, Mechanical Engineering, Yonsei University, 1997

MS, Mechanical Engineering, University of Michigan, 2003

PhD, Mechanical Engineering, University of Michigan, 2005

Professor Kim works with manufacturing science at the microscale, microscale deformation processes, semisolid forming, modeling and fabricating microreactors, and energy conversion devices.



Owen Kolstad
Senior Lecturer

BS, Agricultural Engineering, North Dakota State University, 1991

MS, Agricultural Engineering, University of Minnesota, 1981

MS, Mechanical Engineering, University of Minnesota, 1978



Song-Chang Kong
Associate Professor

BS, Power Mechanical Engineering, National Tsing-Hua University, Taiwan, 1987

MS, Mechanical Engineering, University of Wisconsin, Madison, 1992

PhD, Mechanical Engineering, University of Wisconsin, Madison, 1994

Professor Kong researches experimental engine combustion and emissions studies, biorenewable energy utilization in internal combustion engines, and numerical combustion study and model development using detailed chemical kinetics with computational fluid dynamics.



Adarsh Krishnamurthy
Assistant Professor

Indian Institute of Technology, Madras, B. Tech., Mechanical Engineering, 2005

Indian Institute of Technology, Madras, M. Tech., Mechanical Engineering, 2005

University of California, Berkeley, Ph.D., Mechanical Engineering, 2010

Research interests: Biomechanics, finite element analysis, patient-specific modeling, computational mechanics, geometric modeling, computer aided design and manufacturing, computer graphics.



Valery I. Levitas
Schafer 2050 Challenge
Professor
Department of Mechanical
Engineering and of Aerospace
Engineering

Kiev Polytechnic Institute, Kiev, USSR, MS (Honors) in
Mechanical Engineering, 1978
Institute for Superhard Materials, Kiev, USSR, Candidate of
Sciences in Materials Science, 1981
Institute of Electronic Machinebuilding, Moscow, USSR, Dr. of
Sciences in Continuum Mechanics, 1988
University of Hannover, Germany, Doctor-Engineer habil. in
Continuum Mechanics, 1995

Professor Levitas research includes stress- and
strain-induced phase transformations, high pressure
mechanics and mechanochemistry, structural changes
in materials via virtual melting, multiscale modeling,
strain-induced chemical reactions, and large inelastic
deformation of solids.



Barbara Lograsso
Senior Lecturer

BS Metallurgical and Materials Engineering 1980
MS Metallurgical and Materials Engineering 1982
PhD Metallurgical and Materials Engineering 1991



Meng Lu
Assistant Professor

BS, University of Science and Technology of China, 2002
MS, Electrical Engineering, University of Illinois, 2006
PhD, Electrical Engineering, University of Illinois, 2008

Professor Lu's research interests include optical
sensors, biomedical engineering, sensors for
molecular diagnostics and photonic devices.



Greg Luecke
Associate Professor

BS, Mechanical Engineering, University of Missouri,
Columbia, 1979
MS, Engineering and Applied Science, Yale University, 1987
PhD, Mechanical Engineering, Pennsylvania State University, 1992
Professor Luecke's research interests include robotics
and control, multibody dynamics and simulation, and
artificial neural networks for control.



Margaret Mathison
Lecturer

Ph.D., 2011, Mechanical Engineering, Purdue University
B.S., 2005, Mechanical Engineering, Iowa State University
Research and teaching interests include positive
displacement compressors, HVAC&R equipment, and
modeling and analysis of thermal systems.

Faculty Highlights

Greg Luecke continues significant research with industry partners
Deere and Co. and Wingard Company in the areas of dynamic
simulation, controls, computer interfacing and virtual reality.



Greg Maxwell
Associate Professor
Director, Industrial Assessment
Center

BS, Physics, Purdue University, 1973
MS, Nuclear Engineering, Purdue University, 1977
PhD, Mechanical Engineering, Purdue University, 1984

Professor Maxwell's research interests include energy usage in buildings and HVAC systems, industrial energy efficiency, and nuclear energy.



Scott Merkle
Senior Lecturer

BS, Mechanical Engineering, Iowa State University, 1982
MBA, University of Iowa, 2004



Mark Mba Wright
Assistant Professor

BS, Mechanical Engineering, Iowa State University, 2005
MS, Biorenewable Resources & Technology, Iowa State University
PhD, Mechanical Engineering & Chemical Engineering, Iowa State University

Dr. Wright investigates the cost and performance of energy systems, researching techno-economics, process modeling, and energy conversion. Recent projects investigated the costs and emissions of biomass conversion to gasoline and diesel. He also researches novel ways of converting biomass into fuels. Current research includes low-temperature thermochemical conversion (torrefaction and pyrolysis) of lignocellulosic biomass into platform chemicals and fuels.



James Michael
Assistant Professor

University of Maryland, College Park, B.S., Aerospace Engineering, 2007
Princeton University, M.A., Mechanical and Aerospace Engineering, 2009
Princeton University, Ph.D., Mechanical and Aerospace Engineering, 2012

Areas of interest include optical and spectroscopic diagnostics of reacting, multiphase, and non-equilibrium flows; plasma-assisted combustion; and combustion ignition and control.



Reza Montazami
Assistant Professor

BS, Physics and Astronomy, Virginia Tech, 2007
MS, Materials Science and Engineering, Virginia Tech, 2009
PhD, Materials Science and Engineering, Virginia Tech, 2011

Dr. Montazami's researches smart materials and structures, biomimetic materials and devices, nature-inspired soft microrobotics, mems and nems, functional thin-films, polymeric sensors and actuators, and biomaterials for biomedical applications and devices.

Mark Mba-Wright's research group won first place in the Sustainable Biorefineries poster session at the American Institute of Chemical Engineers conference. They were awarded a Borlaug Fellowship to support food security in Ghana from the US Agency for International Development (USAID), and they published 4 journal papers.

Reza Montazami initiated and directed a strong research program on Advanced Transient Materials, which attracted significant attention from media. Preliminary results are published in *Advanced Functional Materials* (IF 10.44). He has aggressively worked toward improving diversity in the department.

Faculty Highlights

John Oliver leads ISU's Virtual Reality Applications Center and its graduate program in Human Computer Interaction. His research, teaching, and economic development activities focus on human computer interaction technologies, encompassing computer graphics, geometric modeling, virtual reality, and collaborative networks for applications in product development and complex system operation. His research is supported by a variety of industry partners and federal agencies, and the VRAC supports a broad interdisciplinary constituency that spans the entire university.

Sonal Padalkar published a paper: S. Padalkar, J. R. Riley, Q. Li, G. T. Wang, L. J. Lauhon, "Lift-out procedures for atom probe tomography targeting nanoscale features in core-shell nanowire heterostructures" *Physica Status Solidi (c)*, 11, 656 (2014). She is also working on a manuscript from her post-doc work and taught ME 231, Fundamentals of Engineering Thermodynamics – I.

Alberto Passalacqua received \$499,999 from the NSF-ACI SI2 for the development of OpenQBMM, an open-source tool to simulate polydisperse multiphase flows using quadrature-based moment methods. He developed a novel computational model to simulate aggregation and breakup in chemically reacting systems, suitable to investigate the nanoparticle formation in chemical reactors.

Rafael Radkowski reached a milestone in his natural visual perception research by successfully simulating visual depth cues to enhance the spatial understanding of scenes in augmented reality (AR) applications. This will facilitate a better understanding of, for instance, distances and sizes in virtual design reviews. He also introduced an object tracking method for AR that focuses on engineering products and is able to cope with different object sizes and object details.

Soumik Sarkar and his research group have developed hierarchical feature extraction algorithms with an emphasis on Deep Learning tools for complex system modeling and design and demonstrated initial success on microfluidic channels, wind turbine systems and simulated chaotic dynamical systems. Rockwell Collins will be sponsoring a project in 2015 to move this research forward for image and video denoising applications. They have developed Generalized Gossip based policies for distributed optimization and control of multi-agent systems with an application focus on agent-based supervisory control of building HVAC systems for energy efficiency and Iowa Energy Center has awarded a grant for feasibility demonstration in 2015.

Cris Schwartz completed a long-term analysis of student success in the ME major and developed the ME Foundations concept to address the challenges to the Undergraduate Program stemming from underprepared students and rapidly growing enrollment. The effort to determine an optimal group of courses for the Foundations, and to project the long-term impacts, used a data-driven approach that involved multiple ME and non-ME personnel. This approach is the first of its kind in the College of Engineering, and so its implementation may serve as a model for the future of the College in light of its stated mission to deliver a high-quality educational experience.

Howard Shapiro's most notable achievement in 2014 was the successful completion of the 8th edition of *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons, Inc., Hoboken, with M. J. Moran, D. D. Boetner, and M. B. Bailey. This book continues to set the standard for engineering thermodynamics education worldwide.



Jim Oliver

Larry and Pam Pithan Professor of Mechanical Engineering
Director, Virtual Reality Application Center

BS, Mechanical Engineering, Union College, 1979
MS, Mechanical Engineering, Michigan State University, 1981
PhD, Mechanical Engineering, Michigan State University, 1986

Professor Oliver's areas of interest include design and manufacturing process automation using geometric modeling, computer graphics, visualization, simulation, optimization, virtual reality, and human-computer interaction.



Michael Olsen

Professor

BS, Mechanical Engineering, University of Illinois at U-C, 1992
MS, Mechanical Engineering, University of Illinois at U-C, 1995
PhD, Mechanical Engineering, University of Illinois at U-C, 1999

Professor Olsen is active in experimental fluid mechanics and microelectromechanical systems.



Sonal Padalkar

Assistant Professor

BS, Metallurgy, Government College of Engineering, Pune University, India
MS, Physical Metallurgy, Government College of Engineering, Pune University, India
PhD, Materials Engineering, Purdue University, West Lafayette, Indiana, US

Research areas: synthesis, characterization and simulation of hybrid nanostructures for energy related application, synthesis and characterization of nanomaterials for biosensing, utilizing advanced characterization techniques like TEM, HRTEM, EELS, and Atom Probe to obtain solutions for complex research problems.



Alberto Passalacqua
Assistant Professor

PhD, Chemical Engineering, Politecnico di Torino, 2008
MS, Chemical Engineering, Politecnico di Torino, 2004

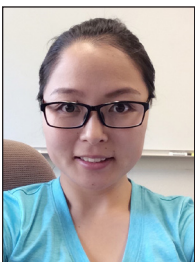
Dr. Passalacqua's research interests include multiphase fluid dynamics, fluid particle flows, quadrature-based moment methods, uncertainty quantification, computational fluid dynamics and numerical methods for computational fluid dynamics, open-source tools for computational fluid dynamics.



Rafael Radkowski
Assistant Professor

Doctor in Engineering: product design with evolutionary algorithm, Graduate School Automatic Configuration in Open System, Heinz Nixdorf Institute, Paderborn, Germany, 2006
Dipl.-Ing. (equal to BS+MS degree), Mechanical Engineering, University of Paderborn, Paderborn, Germany, 2003

Selected research interests: Iterative Closest Points for object identification and tracking; view-dependent rendering and depth cue simulation for CAD workstations; probabilistic search methods for large-scale feature databases.



Juan Ren
Assistant Professor

PhD, Rutgers University, Piscataway, NJ, 2015
BS, Xi'an Jiaotong University, Xi'an, China, 2009

Research interests include nanoscale probe-based broadband biomechanics characterization and high-speed imaging and broad-band viscoelasticity spectroscopy of soft and biological materials.



Soumik Sarkar
Assistant Professor

BE, Mechanical Engineering, Jadavpur University, 2006
MS, Mathematics, Penn State University, 2009
MS, Mechanical Engineering, Penn State University, 2009
PhD, Mechanical Engineering, Penn State University, 2011

Professor Sarkar's research interests include diagnostics, prognostics & supervisory control of complex cyber-physical systems; multi-agent systems and analysis of critical phenomena; human-machine interaction; data mining and visualization, machine learning, probabilistic graphical models; and stochastic time series analysis.



Cris Schwartz
Associate Professor
Associate Chair for Undergraduate Education

BS, Mechanical Engineering, Iowa State University, 1996
MS, Mechanical Engineering, Iowa State University, 1998
PhD, Mechanical Engineering, Iowa State University, 2006

Dr. Schwartz's research interests include biotribology, polymer tribology, wear of biomaterials and the effects of wear debris in vivo, biomedical implant design, and incorporating naturally derived and biodegradable polymers in design.



Howard Shapiro
Lecturer

BS, Mathematics, The Ohio State University, 1969
MS, Mechanical Engineering, The Ohio State University, 1971
PhD, Mechanical Engineering, The Ohio State University, 1975



Pranav Shrotriya
Associate Professor
Associate Chair for Graduate
Studies and Research
Director of Graduate Education

BT, Mechanical Engineering, Indian Institute of Technology, 1995
MS, Theoretical and Applied Mathematics, University of Illinois
at Urbana-Champaign, 1997
PhD, Theoretical and Applied Mathematics, University of Illinois
at Urbana-Champaign, 2001

Professor Shrotriya researches the mechanical response of micro- and nanoscale structures, experimental and computational mechanics at small-length scales, mechanics of surface stress sensors and molecular adsorption, stress-assisted dissolution and damage of biomedical implants, and mechanics of manufacturing processes.



Travis Sippel
Assistant Professor

BS, Mechanical Engineering, University of Kansas, 2006
MSME, Mechanical Engineering, Purdue University, 1997
PhD, Mechanical Engineering, Purdue University, 2001

Professor Sippel's research areas of interest include multiphase combustion, particularly of propellants, explosives, and pyrotechnics, nanostructured energetic materials and novel applications of energetic materials.



Gloria Starns
Senior Lecturer

PhD, Mechanical Engineering, Iowa State University
MS, Mechanical Engineering, Iowa State University
BS, Mechanical Engineering, University of Kentucky

Interests: Private consulting, project engineer for a commercial refrigeration manufacturer



Shankar Subramaniam
Professor

BT, Aeronautical Engineering, Indian Institute of Technology, 1988
MS, Aerospace Engineering, University of Notre Dame, 1990
PhD, Mechanical and Aerospace Engineering, Cornell University, 1997

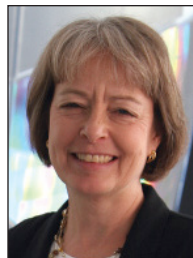
Professor Subramaniam's research interests include spray modeling, modeling and simulation of gas-particle flows and granular flows, combustion, turbulent reactive flows, mixing, stochastic models, particle methods, and computational fluid dynamics.



Sriram Sundararajan
Professor

BE, Mechanical Engineering, Birla Institute of Technology and Science, 1995
MS, Mechanical Engineering, The Ohio State University, 1997
PhD, Mechanical Engineering, The Ohio State University, 2001

Professor Sundararajan's research areas of interest are surface engineering, micro- and nanoscale tribology, multiscale mechanical behavior of materials, scanning probe microscopy, and thin film characterization using three dimensional atom probe microscopy.



Judy Vance
Joseph and Elizabeth Anderlik
Professor of Engineering

BS, Mechanical Engineering, Iowa State University, 1980
MS, Mechanical Engineering, Iowa State University, 1987
PhD, Mechanical Engineering, Iowa State University, 1992

Professor Vance works with virtual reality applications in mechanical engineering including virtual assembly, virtual manufacturing and mechanism synthesis, optimization, and the fundamentals of engineering design including ideation and concept generation.



Xinwei Wang
Professor

BS, Thermal Science and Energy Engineering, University of Science and Technology of China, 1994
MS, Thermal Science and Energy Engineering, University of Science and Technology of China, 1996
PhD, Mechanical Engineering, Purdue University, 2001

Areas of interests: laser-assisted bio-imaging, thermal transport in nanoscale and nanostructured materials, novel technique developments for thermal conductivity measurement of films, coatings and micro- and nanoscale wires/rubes, and laser-assisted nanostructuring.



Jonathan Wickert
Senior Vice President and Provost,
Iowa State University
James and Katherine Melsa
Professor in Engineering
Professor, Department of
Mechanical Engineering

BS, Mechanical Engineering, Univ. of California at Berkeley, 1985
MS, Mechanical Engineering, Univ. of California at Berkeley, 1987
PhD, Mechanical Engineering, Univ. of California at Berkeley, 1989

Professor Wickert's research interests include mechanical vibration and noise control, continuous and multibody systems dynamics, applied mechanics, and applications in computer data storage.



Eliot Winer
Associate Professor

BS, Aeronautical and Astronautical Engineering, The Ohio State Univ., 1992
MS, Mechanical Engineering, State Univ. of NY at Buffalo, 1994
PhD, Mechanical Engineering, State Univ. of NY at Buffalo, 1999

Professor Winer is active in internet technology for large-scale collaborative design; medical imaging, analysis and visualization, multidisciplinary design synthesis, computer aided design and graphics, application in optimal design, and scientific visualization and virtual reality for large-scale design.

Faculty Highlights

Pranav Shrotriya received a new research grant and presented a keynote presentation at the Society of Engineering Science Annual Technical Meeting. He served as the Associate Chair for Graduate Studies and Research and worked with department faculty to increase graduate enrollment to 225 students, making ME the fourth largest graduate and PhD program in the university.

Two of **Travis Sippel's** journal articles were accepted or appeared in publication; two additional articles were submitted, and two conference papers were presented at the AIChE Fall Meeting. Research funding was obtained from Sandia National Laboratory to develop high speed joule heating instrumentation for shock wave instrumentation and the study of energetic material ignition at ultrafast heating rates.

Nine students, Mark Mba-Wright, and **Gloria Starns** traveled to San Isidro, Nicaragua to design and fabricate sustainable systems as an outcome of M E 402x, Human Centered Design; the experience of co-designing products with the Nicaraguan community was transformative for everyone involved in the class.

Shankar Subramaniam was awarded the College of Engineering's Accelerating Collaborative Research Initiative (ACRI) grant for developing a strategic research thrust in multiphase flows through the Center for Multiphase Flow Research. He delivered invited seminars at Chemeca 2014 in Perth, Australia, and at the Enabling Process Innovation through Computation (EPIC) Seminar Series in LSU. He delivered the Lindbergh Lecture at University of Wisconsin, Madison, and also participated in the Stanford Center for Turbulence Research's 2014 Summer Program.

Sriram Sundararajan is the College of Engineering Equity Advisor. Through this role, he works with college leadership to enhance the diversity of the faculty body. He assumed leadership of the Broader Impacts Platform of the Iowa NSF EPSCoR project and helps build research infrastructure across the state.

Judy Vance co-edited a book entitled "Advances in Computers and Information in Engineering Research" published by ASME Press. This is the first volume in a series covering current research in Advanced Modeling and Simulation; Computer-Aided Product and Process Development; Systems Engineering, Information and Knowledge Management; and Virtual Environments and Systems.

Xinwei Wang has 15 papers published or accepted for publication in highly visible journals, and one book chapter accepted for publication. He received the Iowa State University Award for Mid-Career Achievement in Research, and was elected to Fellow Grade of ASME. In 2014, he has been advising 10 Ph.D. students, two M.S. students, and one visiting scholar to do research in his lab on various frontier thermal transport areas.

Research in **Eliot Winer's** lab continued on using Augmented Reality in manufacturing during training and daily work. Dr. Winer also researched the fusion of sensor and self-reported data during human subject testing in a manufacturing task. Lastly, researchers in Dr. Winer's group studied the effects of stereopsis on spatial tasks in a medical context. Results showed that for medical training, diagnosis and treatment, the effect is significant.

Emeritus Faculty

Shyam Bahadur
Bill Bathie
Joseph Baumgarten
Jim Bernard
Jerry Colver

Bill Cook
Richard Danofsky
Paul DeJong
Arvid Eide
Jerry Hall
Alexander Henkin

Alfred Joensen
George Junkhan
Pat Kavanagh
Charles Mischke
Ron Nelson
Ted Okiishi

Mike Pate
Leo Peters
Don Roberts
George Serovy
Howard Shapiro
Bernard Spinrad

Industry Advisory Council

Brett Anderson

Boeing

Brett is an Iowa State BSAE alum and has been with The Boeing Company since 1989. He coordinates with internal and external technology experts to identify short and long term roadmaps to match business unit needs with strategic direction for both technology development and business opportunities.

Jeremy Berg

Cargill, Inc.

Greg Brown, IAC Chair

Department of Orthopaedic Surgery, Park Nicollet Clinic - Meadowbrook

Greg received his BSME at Iowa State and went on to get graduate degrees at MIT and was accepted into Harvard Medical School. Dr. Brown joined the Olympia Orthopaedics Associates in Olympia, Washington and specializes in fracture care and sports medicine.

Diane Fischer

Black & Veatch

Mike Hilby

John Deere

An alum of the department, Mike leads the Operations organization at John Deere Product Engineering Center. He is responsible for the efficient planning and growth of all Global Tractor Platform PV&V facilities.

Mike Jensen

Caterpillar

Mike is a BSME graduate of Iowa State and serves as a Senior Engineering Tech Team Leader at Caterpillar. His activities encompass working enterprise-wide new product development program challenges related to updating the Caterpillar machine product line to meet upcoming diesel engine emissions regulations.

Cynthia Lord

Alliant Energy

Cynthia is a BSME alum of Iowa State and has spent over 27 years in the energy industry. She is a manager in the Generation Engineering department for Alliant Energy, and is responsible for supporting the engineering needs of 15 power plants across Iowa, Wisconsin, and Minnesota.

David O'Brien

Lyondellbasell

Dave is a BSME alum and started at Lyondellbasell as a co-op engineering in 1990. He is currently the Machinery Group Lead and helps perform troubleshooting, executes upgrades, and provides technical support for the operation and maintenance of rotating equipment such as steam turbines, centrifugal compressors, and pumps.



*The ME Industrial Advisory Council meets in the fall and spring each year.
This photo was taken at the Fall 2014 meeting in Ames.*

Robin O'Callaghan

Kiewit Power, Inc.

Robin graduated from the ISU ME program and is employed as an operational mechanical engineering at Kiewit Power in Lenexa, KS. Robin has been active in Iowa State recruitment and is a licensed engineer in three states.

Jason Olberding, IAC Vice Chair

Emerson Process Management

Jason is an ISU ME graduate and serves as the Special Products Group Manager at Emerson Process Management in Waterloo, IA.

Nancy Stewart

3M

Nancy graduated from ISU with a BS in mechanical engineering and joined 3M shortly afterwards. She has worked in a variety of positions at 3M and is currently serving on an assignment in the Lean Six Sigma Organization in the Skin & Wound Care Division.

Kyle Wehring

Rockwell Collins

Kyle is an ISU BSME graduate and serves as a design engineer at Rockwell Collins. He is responsible for mechanical design and packaging of electronics for fixed site, ground vehicle, and airborne applications.

Joe Wright

Sauer Danfoss

Adjunct and Courtesy Appointments



Ashraf Bastawros
Adjunct Associate Professor
Aerospace Engineering

BS, Mechanical Engineering, Cairo University, Cairo, Egypt, 1988
MS, Mechanical Engineering, Cairo University, Cairo, Egypt, 1991
MS, Applied Mathematics, Brown University, Providence, RI, 1995
PhD, Engineering, Brown University, Providence, RI, 1997

Dr. Bastawros' research interests include micro and nano surface machining, experimental methods to study structure-property relationships, and thermo-mechanical characteristics of porous solids and biological materials.



Leonard Bond
Courtesy Professor
Aerospace Engineering

PhD., City University - London

Ultrasonics applied to nondestructive evaluation (NDE)

Advanced diagnostics and prognostics, to estimate safe service life, applied to aerospace and energy systems.



Wei Hong
Courtesy Assistant Professor
Aerospace Engineering

PhD, Engineering Sciences, Harvard University, 2006
MS, Engineering Mechanics, Tsinghua University, Beijing, China, 2002
BS, Engineering Mechanics, Tsinghua University, Beijing, China, 2000

Dr. Hong's research interests include solid mechanics, soft materials, smart materials and structures, fracture and microstructure evolution, and multiphysics modeling and simulation.



Terry Meyer
Collaborator Professor
Purdue University

BS, Mechanical Engineering, University of Minnesota, 1993
MS, Mechanical Engineering, University of Illinois at Urbana-Champaign, 1997
PhD, Mechanical Engineering, University of Illinois at Urbana-Champaign, 2001

Professor Meyer's areas of interests are laser imaging and spectroscopy for reacting fluid flow and sprays, biorenewable fuels, combustion, power and propulsion, gas-turbines, scramjets, hypersonic vehicles, and internal combustion engines.



Richard T. Stone
Courtesy Assistant Professor
Industrial and Manufacturing
Systems Engineering

BS, MIS, The Rochester Institute of Technology, 1999
Adv. Cert, Environmental Management Science, 2002, Robotics and CAM, 2001, The Rochester Institute of Technology
MS, IT with concentration in Robotics and W/M programming, The Rochester Institute of Technology, 2001
PhD, Industrial and Systems Engineering, The University of Buffalo, SUNY, 2008

Research interests: human performance enhancement in both physical and mental domains. He employs multiple approaches toward this goal, including cognitive and physiological engineering, classical and experimental ergonomics, augmented reality, and the incorporation and application of new technologies.

Staff

Kiewit Undergraduate Student Services Center



Fred Lloyd
Academic Adviser



Alyssa Mittleider
Academic Adviser



Hazel Peterson
Advising Secretary



Mallory Quinn
Academic Adviser



Jessica Van Winkle
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Cindy Bartleson
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Alex Rausch
Communications
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Deb Schroeder
Secretary



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Undergraduate
Program Assistant



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Grant Program
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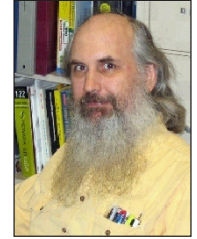
Laboratory and Information Technology



Sandy Bremer
Teaching Laboratory
Coordinator



Joel Buehler
Systems Support
Specialist



Jim Dautremont
Laboratory
Mechanical
Technologist



Josh DeLarm
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Derek Dickson
Systems Support
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John Howell
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Nate Jensen
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Wyman Martinek
Teaching
Laboratory
Coordinator



Craig Severson
Teaching Laboratory
Coordinator



Jim Shelledy
Teaching
Laboratory
Coordinator

Publications

Peer-Reviewed Journal Publications

- D. Attinger**, C. Frankiewicz, A. R. Betz, T. M. Schutzius, R. Ganguy, A. Das, C.-J. Kim, and C. M. Megaridis, "Surface engineering for phase change heat transfer: A review," *MRS Energy & Sustainability*, vol. 1, 2014.
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- Kim, K., **Bai, X.**, Rover, M., Brown, R. C. (2014), The effect of low-concentration oxygen in sweep gas during pyrolysis of red oak using a fluidized bed reactor, *Fuel*, 124 (15), 49-56.
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Responsibilities

The Department of Mechanical Engineering at Iowa State University is a community of faculty, staff, students, and alumni—and industrial and governmental partners—working together to improve the state of Iowa and society in the broadest terms through mechanical engineering research, education, and service.

Vision

Through the excellence of its people, the Department of Mechanical Engineering will be recognized as a leader of its discipline in a manner that exemplifies the land-grant traditions of learning, discovery, and engagement. The department will be a desirable place to study and work, with its community comprising the best and brightest, and with research and educational programs grounded in the mechanical engineering sciences and set within the context of meeting important societal needs.

Mission

The mission of the Department of Mechanical Engineering has three tenets centered on the principle of improving lives and livelihoods: to create knowledge through research in the science and technology of mechanical engineering; to share knowledge through educational programs and the dissemination of new discoveries; and to develop the professional potential of faculty, staff, and students.

Priorities

We will pursue the following priorities to reinforce our recognized strengths and advance our vision for 2025.

- Extend our pillars of research excellence
- Strengthen our graduate program
- Enrich our undergraduate program
- Develop our people
- Build our community

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