Year in Review

The 2009–2010 academic year was one of transition with several challenges and many significant achievements within the department. Despite a state-imposed 10 percent across-the-board budget reduction last fall, the Department of Mechanical Engineering remains strong and is still the most popular degree program on campus. We continue to focus on our land-grant missions of teaching, research, and service using our strategic plan as an outline. As we move forward, the search for a permanent chair will begin fall 2011 with the expectation of having this position filled by fall 2012.

We continue to add to the growing list of departmental “points of pride,” and the past academic year was no exception. Graduate applications increased by 75 percent and the undergraduate program saw record enrollment of more than 1,100 students. Several faculty members made headlines as well. Software developed by Jim Oliver and Eliot Winer was the basis for the company BodyViz; this software was used on the TV program The Biggest Loser Couples to show contestants their body scans in 3-D. Ross Morrow was interviewed on Bloomberg Television and quoted in the The New York Times Dot Earth blog for his work on assessing fuel taxes. Mark Bryden was a recipient of a 2009 R&D 100 Award for his software development work in virtual engineering. Additional faculty and staff highlights can be found throughout this report.

To look ahead to next year, we must recognize several people who have recently made a significant impact on the department. Sriram Sundararajan, who served as the Associate Chair for Graduate Studies and Research and Director of Graduate Education (DOGE), and Michael Olsen, who served as the Associate Chair for Undergraduate Studies helped maintain and implement new techniques and strategies to benefit both the graduate and undergraduate programs. We thank them for their service and leadership during the past academic year.

Pranav Shrotriya will be our new Associate Chair for Graduate Studies and Research and DOGE as Sriram takes over as the Associate Chair for Undergraduate Studies. Michael Olsen will lead our search to hire new faculty into our department. I look forward to working with them in these new and challenging roles.

We say goodbye and good luck to Sherrie Nystrom as she retired in July. Sherrie was a staff member in the department for five years and worked in a variety of positions such as secretary to the chair, advising center secretary, and departmental programs secretary. She has been at the university for nearly 40 years and will be missed.

Some of our immediate goals for the upcoming year are to continue involvement in noteworthy research, retain strong numbers for student admissions, and hire quality faculty members who excel in teaching and research. As a department, we look forward to growing our community of faculty, staff, students, and alumni, and to extending our service through educational, research, and service programs. We thank you for your interest in our department and truly look forward to what the 2010–2011 academic year will bring.
Performance Indicators

Degrees Awarded

Bachelor's Degrees Awarded

Undergraduate Enrollment

Fall Undergraduate Enrollment

Graduate Enrollment

Fall Graduate Enrollment

Graduate Program Recruitment

Complete Applications

Selectivity: Ratio of Complete Graduate Applications to Admissions Offers

Conversion: Graduate Admission Offers to Acceptance Ratio
Department Operations

Private Giving: Black-Nilstrom Gift Production

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Private Giving: Total Gift Production

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Departmental General University Budget

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Personnel (FTE)
Tenure and tenure-track faculty: 25.8
Non-tenure eligible lecturers: 5.0
P&S and merit staff: 13

Research
Journal papers published: 76
Conference papers published: 60
Sections or chapters in books, monographs, or similar volumes: 5
Patents awarded: 1
Doctoral dissertations: 7
Master’s theses/projects: 23

Professional Society Fellows
American Society of Mechanical Engineers
Robert Brown
Abhijit Chandra
Atul Kelkar

Bergles Professor of Thermal Science
Ted Heindel

Gary and Donna Hoover Chair in Mechanical Engineering
Robert Brown

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

Michael and Denise Mack 2050 Challenge Scholar
Erin MacDonald

Schafer 2050 Challenge Professor
Valery Levitas

William and Virginia Binger Assistant Professor of Mechanical Engineering
Song-Chang Kong

William March Scholar in Mechanical Engineering
Baskar Ganapathysubramanian
Enrollment
Enrollment in the undergraduate program during the 2009–2010 academic year was 1,124 students. Of this number, 7 percent were women and 6 percent were minorities. During the 2009–2010 academic year, 225 bachelor’s degrees were awarded. In addition to the traditional bachelor degree program, the mechanical engineering department also offers concurrent degree programs leading to a BS/MS in mechanical engineering or a BS in mechanical engineering and an MBA. The recently added minor in nuclear engineering graduated its first students in the 2009–2010 academic year, and enrollment in this program now stands at 24 students.

Industrial/Academic Partnership in Design
Design courses throughout the curriculum continue to emphasize student interaction with industrial partners and charitable organizations. Recent design projects have involved collaboration with companies such as John Deere, Bell Water Systems, and TPI composites; work with non-profit organizations including Camp Courageous and Harmony House; and entrance in national design competitions such as the NASA Lunar Mining Competition.

International Study and Travel Opportunities
The undergraduate program offers opportunities for students to study abroad in Wales, Australia, Germany, Spain, and Mexico. Courses are also offered in sustainable engineering that culminate in class trips to underdeveloped countries such as Mali and Nicaragua to directly apply the technologies taught in the classroom. Students can also participate in student exchange with universities within the U.S. Twenty percent of spring 2010 graduates had international educational or work experience.

Mechanical Engineering Beyond the Classroom
The ME program provides many opportunities for students to apply their knowledge and skills beyond the classroom. These include national design competitions such as Mini Baja, Formula SAE, the team PriSUm solar car, and the Interlock House, Iowa State’s entry in the U.S. Department of Energy’s Solar Decathlon. Students are also able to gain work experience through internships and co-ops with both Iowa and national industries. Eighty-five percent of spring 2010 ME graduates had co-op, internship, or summer work experience.

Women in Mechanical Engineering (WiMe) Program
The goal of the Women in Mechanical Engineering program is to provide resources to recruit and retain women in the mechanical engineering field. To accomplish this, the WiMe program provides scholarship opportunities, social events, networking opportunities with faculty and industry, and mentoring by women engineers in industry.

Undergraduate Program Highlights

Sriram Sundararajan
Associate Chair for Undergraduate Studies

Fall 2009
CIRAS Sponsored Projects
Armstrong Machine Company, Pocahontas, IA: Grout pump hydraulic control design
• John Crosette, Brandon Grimm, Chan “Stan” Lee, Andrew Voss*, Kyle Hodes*, Eric Murphy, Brian Rau, John Trivison, Derek Tramp

Deboson Pipe Organ Builders Ltd, Lake City, IA: CNC router process design
• Lucinda Frenaeu, Jacob Hetzel, Zach Kienaka*, Emily Leafstadt, David Smit

Ahmad Baharudrin, Brandon Foster, Kevin O’Connell*, Dan Schrader
Double Ht Manufacturing, Rock City, IA: Hitch pin plastisol process design
• Mark Brayton*, Brett Cooper, Philippe Hevesy, Christopher Iacono, Sean Sturm

North American Manufacturing, Rockwell, IA: Roll press process design
• Nathan Anderson*, Jason Barnhart, Jermey Hislabeach, Orin Lanz

Industrial Design Fabrication and Installation Inc., Moville, IA: Greaseless conveyor chain design
• Michael Rice, Ilya Ellen*, Will Friese, Andrea Park, Dan Sprague

Justin Augustyn, Tyser Fast, Jordan Lee, Peter Martinson*, Robert Pek
Power Engineering and Manufacturing, Ltd., Waterloo, IA: Transmission test stand design
• Brandon Haroove, Lewis Jones, Nathan Manor*

Kyle Fichtner, Nathan Gibilisco, Eric Meraco*, James Michelson, Joseph Mistrett
Power Engineering and Manufacturing, Ltd., Waterloo, IA: Transmission box cover monitoring design
• Michael Bridwell*, Kwan Choong Chin, Jacob Pratt

Isaac Garlinton*, Kevin Gehlre, Don Kieou, Nathaniel Renner, Timothy Schrad
Van Gorp Corporation, Pella, IA: Conveyor roller spiral wrap process design
• Kristopher Anderson*, Matthew Britton, Jon Debower, Austin Tech, Robby Tharp

Waters Hot, Inc., Orange City, IA: 4-way control valve design
• Mitch Dangria*, Kathy Kelle, Nicholas Lucas, David Prate, Joseph Rodak

Jason Boggs*, Diana Gylling, Lee Harris, Theodore Hotvet, Laurel McDonough

Service Project
Camp Courageous of Iowa, Monticello, IA: Solar water heating system
• Randy Collison, Jasmine Draper, Zach Kaesker*, Andrew Theobald, Woodrow Withrow

Student Projects
Feuerhelm Construction, St. Charles, MN: Freight elevator design
• Dan Apperson, Jeff Feuerhelm*, Jonathan Henbiberger, Jakob Wunn

Iowa State-SAE Student Branch: Baja vehicle suspension design
• Alex Brimney, Joshua Klocke*, Shane Pearson, Andrew Smit, Skylar Tewshead

Spring 2010
CIFAS Sponsored Projects
Creative Composites, Ankeny, IA: Lubricant testing machine design
• Carl Friedmann, David Gustafson, Tom Maude, Steven Nelson, Eric Nichols*

Skyler Teachout, Zebulon Fisher, Robert Jaeger, John O’Brien, Ali Sireli, Brent Teake
Cycle Country Accessories, Spencer, IA: ATV snow blade ski design
• Brian Baird, Jeff Cook, Benjamin Dunnigan, Matthew Fisher, Joe Gueling*

Adam Barnard, Jacob Cronbaugh*, Gary Mraz, Jacob Schrader, Andy Warden
ESCP Inc., Davenport, IA: Concrete industry power tool design
• Taylor Askelsen, Zach Halbur, Ryan Olson, Derek Steenman*, Kat Tanaka, Aaron Werthold

John Fenak, Kristin Foy*, Eric Shannon, Charles Weldon, Matt Ziman
Jancy Engineering Inc., Davenport, IA: Pipe bender portable base design
• Adam Harmon*, Dylan Jans, Chadu Liang, Johnstho Ritchie

Seth Babcock, Kyle Engel, John Gardener*, Elliot Hof, Tim Klinga, Anthony Sikora
Jancy Engineering Inc., Davenport, IA: Magnetic base drill power feed accessory design
• Joe Briggs, Joseph Jens*, Trevor McCoy, Benjamin Peterson, Bob Scharfenkamp

Brian Conley*, Michael Dunlay, Greg Langenfeld, Matthew Martin, Ivan Riceki, Ryan Tweten
TFL Lighting Products, Inc., Carroll, IA: Electric car charging station
• Marcus Jacobson, Jeremy Keiser, Eric Matsuaka, Justin Voss*, Jonathan Wyman

Jonathan Determan, Katiit Faulds, Tyler Gibney, Sergio Pinon, Ryan Spindler*, Jeff Turner
Thornbom Manufacturing, Newton, IA: Pallet handler redesign
• Chad Anderson, Thomas Cooper, Samuel Huffman*, Bryan Lemke, Jerry Lynch, Clint Weinberg

Sim Chew, Pierre Gilles*, Eric Lo, Tim Marquardt, Hao Tran, Troy Zimmerman
Corporate Sponsored Projects
Whirlpool Corporation, Benton Harbor, MI: Blender drive redesign
• Steve Cooon, Ryan Hinrichsen, Amada Newendorp, Kyle Parks, Alden Petersen*, Aaron Weinschenk

Don Chandler, Enrique Osuna, Logan Schutz, Grant Urban, Ryan Wacker, Heather Wilson*

Service Project
Iowa State FPM-EHS Department: Fire extinguisher status check
• Jaime Benitez, Dan Galuska, Ryan Lefevre*, Allison Vigoya

*Team leader

For more information or if you have questions about our senior design projects, contact Jim Heise at jheise@iastate.edu or 515 294-3857.
Enrollment

In the 2009–2010 academic year, the mechanical engineering department had 174 graduate students enrolled. These consisted of 86 master’s students and 88 PhD students. Nineteen students were women and 15 were minority students. The enrollment numbers include 44 students pursuing their master’s degrees via distance education.

Degrees

The department granted 23 master’s degrees and 7 doctoral degrees in 2009–2010. Upon graduation, one MS and two PhD student received graduate research excellence awards and two of our PhD students received graduate teaching excellence awards.

Recruitment and Support

We had 213 students apply to our graduate program for admission in fall 2009. Of these applicants, 52 students were admitted and 46 students enrolled. Overall the department supported 25 students through teaching assistantships and 82 students through research assistantships. In addition, seven students were awarded fellowships including one winner of the prestigious National Science Foundation Graduate Fellowship.

BS/MS Program

The concurrent BS/MS program continues to provide students with the opportunity to earn both a BSME and an MSME following five years of study as well as exposure to research as early as their junior year. In 2009–2010, the department enrolled 10 new students to the program.

Career Paths

Our graduates enjoy tremendous visibility among industry and academia. A large fraction of our graduates pursue positions in industry with such renowned companies as John Deere, Caterpillar, 3M, Intel, and Garmin. Recent graduates have also found faculty and post-doctoral opportunities with institutions such as Massachusetts Institute of Technology, Australian National University, Oak Ridge National Laboratory, and Trine University.

Recent Developments

The department launched its new coursework-only professional master’s degree program (master of engineering) in fall 2009 with 19 students enrolled. Two of these students completed the degree in two semesters and graduated in spring 2010. Working with Engineering Distance Education, we anticipate strong growth in this program in upcoming years with the development of graduate minors in strategic areas of interest to our industrial stakeholders.

Our aggressive recruiting continues to yield rich dividends. Our application count is the highest it has been in the last five years, including a marked increase in the number of domestic applicants. Our efforts of increasing student diversity have also resulted in the program enrolling the highest level of women and minority students in the last decade. Graduate program staff members have successfully pursued university grants to enhance regional recruitment efforts and increase fellowship monies to attract the best prospects for our program. Finally, the department has established new graduate course requirements to enable students to achieve the appropriate depth in mechanical engineering as well as the necessary breadth to excel in interdisciplinary research.

Doctoral Dissertations

Daniela Faas
Major Professor: Judy Vance

Sergei Markutysya*
Dissertation: Modeling and Simulation of Nanoparticle Aggregation in Colloidal Systems
Major Professor: Shankar Subramaniam

Kumar Karra
Dissertation: Parametric Study and Optimization of Diesel Engine Operation for Low Emissions Using Different Injectors
Major Professor: Song-Chang Kong

Derek Wissmiller
Dissertation: Pyrolysis Oil Combustion Characteristics and Exhaust Emissions in a Swirl-stabilized Combustor
Major Professor: Terry Meyer

Ying Wu*
Major Professor: Qingze Zou

Ronald Bremner
Dissertation: Rapid Optimization of Interior Permanent Magnet (IPM) Machines Using the Response Surface Method and Dimensionless Parameters
Major Professor: Ron Nelson

Xiaohui Zhou
Dissertation: A Plug and Play Framework for an HVAC Air Handling Unit and Temperature Sensor Auto-recognition Technique
Major Professor: Ron Nelson

*Research Excellence Award
Research Portfolio

Biological and Nanoscale Sciences
Pranav Shrotriya, Program Director

The biological and nanoscale sciences program investigates problems at the interface of engineering, biology, and nanotechnology, enabling us to apply the fundamental principles of mechanical engineering to expand opportunities for new science and engineering breakthroughs. Faculty members in the program have received funding from the National Science Foundation to host a summer Research Experience for Undergraduate (REU) site on microscale sensing, actuation, and imaging (MoSAic). The MoSAic REU site provides research experiences that address fundamental issues concerning design and manufacture of sensors, actuators, and smart materials, as well as state-of-art imaging and diagnostic systems. The research activities address fundamental issues in mechanical engineering at several scales ranging from the molecular to the mesoscale.

Clean Energy Technologies
Terry Meyer, Program Director

The clean energy technologies program investigates alternative energy and energy efficiency methods that have a positive effect on the environment. The course Applications of Sustainable Engineering in Development, in conjunction with an Engineers Without Borders site visit, gave students the opportunity to build battery charging stations and lighting in three villages that had no electricity or lighting, design a human power grain grinder for use by village women, and build and test enhanced cookstove designs to improve women’s health. The undergraduate senior design program was also involved with several sustainable energy projects during the school year. Faculty members have been busy with many areas of research such as waste-to-energy technologies, wind speed energy conversion, and new burner technologies for ethanol processing.

Complex Fluid Systems
Shankar Subramaniam, Program Director

Shankar Subramaniam, together with several other faculty members (LeAnn Faidley, Baskar Ganapathysubramanian, Gap-Yong Kim, Song-Charng Kong, Terry Meyer, and Michael Olsen) organized a one-day workshop on complex fluid systems at Iowa State. The conference brought together leading university experts to foster interactions and promote future collaboration in the field, as well as help pursue large collaborative research funding opportunities. During the workshop, five technical track presentations and a graduate student poster session were held, along with afternoon breakout sessions that allowed participants to discuss key areas of interest. A summary of the presentations concluded the workshop.

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Terry Meyer, Program Director

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Design and Manufacturing Innovation
Abhijit Chandra, Program Co-Director
Gap-Yong Kim, Program Co-Director

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, which include chemical mechanical planarization, laser processing, tribology at the micro/nanoscale, surface engineering, and characterization for biomedical applications.

In 2009, the DMI program sponsored the 2nd Annual Excellence of Graduate Research Conference where six awards were granted. Next year, the group would like to expand the event to include the biological and nanoscale sciences program to promote graduate research and provide opportunities for collaboration in interdisciplinary areas. The program also offered compensation for student conference travels to enrich graduate study experience within the program. Additionally, the group partially supported the acquisition of a high-end profiler (Zygo) for undergraduate laboratories and graduate research. The equipment will enable high quality, hands-on lab experience for undergraduate students and enable synergistic research opportunities.

Simulation and Visualization
Song-Charng Kong, Program Director

Faculty members of the simulation and visualization program develop advanced computational and experimental techniques to understand and predict physical phenomena. We also create unique image rendering methods to enhance the interpretation of complex systems. For example, James Oliver and Eliot Winer developed a technology to convert flat images from medical scans into 3-D images. Their technology was used in NBC’s The Biggest Loser Couples to show contestants’ MRI scans in 3-D. Another technology that received Hollywood attention is the high-speed, high-resolution 3-D imaging technique developed by Song Zhang. Shown in the figure, the 3-D image mimic movement in real time. This innovative technology, developed under the support of the Department of Justice, has tremendous potential in numerous applications.

Another highlight is the simulation tool developed by Baskar Ganapathysubramanian on accelerating the development of organic solar cells (OSCs) for harnessing solar energy more efficiently. This multi-scale computational framework is being used to investigate the property-structure and process-structure relations in OSCs. This simulation technology will subsequently be used to computationally optimize processing conditions to tailor the morphology to achieve high-efficiency OSCs.

The faculty will continue to develop innovative simulation and visualization technologies that can be used to explore various science frontiers as well as use in daily life. One goal is to enable scenarios for products or processes to be altered and tested in a virtual environment before any prototypes are created. Such capability in virtual engineering will significantly reduce the time and cost associated with product development and process optimization.
Department Organization

Industrial Advisory Council (IAC)

Brett L. 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 road maps to match business unit needs with strategic direction for both technology development and business opportunities.

Scott Bowman, IAC Chair
KJWW

Scott is an alum of the ME department and has worked at KJWW Engineering in Des Moines since 1989. His specialties include project delivery, project management, contracts, direct digital controls, energy efficiency, sustainable design, LEED, and commissioning.

Craig Connell
Black & Veatch

Craig is a BSME graduate of Iowa State. Upon graduation, he joined the global engineering and construction company Black & Veatch. He is currently a Vice President and the Director of the Corporate Project Management Office, responsible for establishing policies, practices, systems, and tools for management and project controls globally.

Mike Hilby
John Deere

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

Dave O’Brien
LyondellBasell

Cynthia Lord, IAC Vice Chair
Alliant Energy

Cynthia is a BSME alum of Iowa State and has spent more than 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.

Jason Olberding
Emerson Process Management

Staff

Kiewit Undergraduate Student Services Center

Denise Birney
Secretary

Kevin Osgerby
Academic Advisor

John Wagner
Academic Advisor, Lead Advisor

Johna Wolfe
Academic Advisor

Business Office

Mary Bilstad
Program Coordinator

Amy Carver
Program Assistant for Graduate Education

Larry Couture
Teaching Laboratory Coordinator

Jim Dautremont
Laboratory Mechanical Technologist

Laboratory and Information Technology

Carol Knutson
Account Clerk

Janelle Miranda
Program Assistant for Undergraduate Education

Nate Jensen
System Support Specialist

David Lennon
Teaching Laboratory Coordinator

Denise Wright
Department Secretary

Deb Schroeder
Department Secretary

Denise Wright
Administrative Specialist, Assistant to the Chair

Hap Steed
Manager, Technical Services

Staff Highlights

Denise Birney graduated with a BA in Human Resource Management from Briar Cliff University.

Johna Wolfe earned a Master of Education in Higher Education with an emphasis on student affairs. It is her second master’s degree from Iowa State.
ultrasound safety and therapy applications. and exploring ultrasound-induced bioeffects for signals, applying ultrasound to treat infections, properties of tissue using back-scattered ultrasound ultrasound to treat cancer, quantifying physical

Champaign, 2001 University of Illinois at Urbana-

MS, Electrical Engineering, 1998

University of Wisconsin, Madison, 1998

Assistant Professor

Mechanical Engineering

Computer Engineering

MS, Engineering Mechanics, 1999

B.A., Mathematics, University of Missouri, 1976

Distinguished Professor

Mechanical Engineering

Robert Brown

Anson Marston

BS, Engineering Mechanics, University of Michigan, 1965

Ph.D., Engineering Mechanics, University of Michigan, 1971

Professor Bernard works with real-time applications of computer modeling and simulation, particularly vehicle dynamics applications, and interactions between technology and globalization.

Timothy Bigelow

Assistant Professor, Mechanical Engineering and Electrical and Computer Engineering

Boston, MA, 2006

Assistant Professor

Mechanical Engineering

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.

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.

LeAnn Faidley

Assistant Professor

BS, Physics, Iowa State University, 1999

BS, Engineering Science, Iowa State University, 1999

MS, Engineering Mechanics, Iowa State University, 2001

MS, Mechanical Engineering, The Ohio State University, 2005

PhD, Mechanical Engineering, The Ohio State University, 2006

Professor Faidley studies active/smart materials, structures and systems, the characterization, modeling, application, and control of magnetically activated materials, magnetorheological elastomers, and smart materials for medical devices.

Baskar Ganapathysubramanian

William March Scholar in Mechanical Engineering Assistant Professor

Indian Institute of Technology, Madras, B. Tech., Mechanical Engineering, 2003

Cornell University, MS, Mechanical and Aerospace Engineering, 2006

Cornell University, PhD, 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.

Ted Heindel

Interim Chair 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.

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.

Abhijit Chandra developed a multi-physics and multi-scale analysis methodology to predict defectivity in polishing processes. A sensitivity analysis based on this methodology can be used to develop defect avoidance strategies. The group developed life prediction protocol for hip implants that was recently adopted by German industry.

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

Assistant 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, semisoluid forming, modeling and fabricating microreactors, and energy conversion devices.
LeAnn Faidley's research program continued to expand into characterization of soft-magnetically activated smart materials and other applications of smart materials. Additionally she completed the development and implementation of brand new labs for ME 421, System Dynamics and Controls, based on a scenario approach. She was also active in diversity efforts within the department.

Sebastien Feve published two co-written reports with the National Highway Transportation Safety Administration based on his earlier work with tire research from 2006.

Faculty Highlights

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Sebastien Feve published two co-written reports with the National Highway Transportation Safety Administration based on his earlier work with tire research from 2006.
W. Ross Morrow
Assistant Professor of Mechanical Engineering, with a Courtesy Appointment in the Department of Economics
BS, Mechanical Engineering, University of Michigan Ann Arbor, 2001
MS, Applied Interdisciplinary Mathematics, University of Michigan Ann Arbor, 2008
PhD, Mechanical Engineering, University of Michigan Ann Arbor, 2008
Professor Morrow works with engineering design; environmentally benign engineering; environmental regulatory policy and engineering design; numerical methods for nonlinear problems; optimization and equilibrium problems; and models of consumer choice.

Ron Nelson
Professor
BS, Mechanical Engineering, Iowa State University, 1970
MS, Mechanical Engineering, Iowa State University, 1972
PhD, Mechanical Engineering, Stanford University, 1981
Professor Nelson's interests include energy conversion and utilization, environmental control, thermal system optimization, and applied artificial intelligence.

Jim Oliver
Larry and Pam Pithan Professor of Mechanical Engineering
Director, CyberInnovation Institute
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.

Mike Olsen
Associate Professor
BS, Mechanical Engineering, University of Illinois at Urbana-Champaign, 1992
MS, Mechanical Engineering, University of Illinois at Urbana-Champaign, 1996
PhD, Mechanical Engineering, University of Illinois at Urbana-Champaign, 1999
Professor Olsen is active in experimental fluid mechanics and microelectromechanical systems.

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

Shankar Subramaniam
Associate Professor
BS, 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
Associate Professor
Associate Chair for Undergraduate Studies
BS, 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.

Faculty Highlights
Adin Mann continued to work on building a national network of engineering faculty who share the same vision of broadening the participation of underrepresented minorities working in industry, government, and the professoriate in the engineering field. He also has continued his efforts on developing tools and models to assess the strength of maize hybrids to withstand weather, develop sound in a virtual environment to control actions, and improve modeling of flow induced pipe vibration.

Greg Maxwell continues to be involved with Iowa State's Industrial Assessment Center, working with industries to improve efficiency and reduce energy costs.

Terry Meyer's work in laser diagnostics for combustion and alternative fuels has received new funding support from the Department of Energy, Air Force Office of Scientific Research, and Iowa Energy Center. Dr. Meyer serves as Director of the Clean Energy Technologies Program in the Department of Mechanical Engineering, serves as co-chair for two major research conferences, and was recently given the Young Researcher Award in Advanced Optic Technologies by a major research institute in Erlangen-Nuremberg, Germany, with a 4-year position as a visiting professor.

Pal Molian has had high quality journal publications with a high reputation as a reviewer of numerous journals and National Science Foundation panels in the area of materials and manufacturing.

W. Ross Morrow started his academic career at Iowa State in the fall of 2009 after completing a post-doctoral research fellowship in the Harvard Kennedy School’s Energy Technology Innovation Policy group. He recently published an analysis of transportation energy policy options in the journal Energy Policy. He gave several seminars in 2009 concerning transportation policy, equilibrium pricing, and numerical methods for large-scale nonlinear systems.
Faculty Highlights
Ron Nelson has been on phased retirement and taught two courses in the fall. He also continued to work with five graduate students and was the mechanical engineering faculty member on the U.S. DOE Solar Decathlon competition. He did the energy modeling for the SolarD net-zero energy building and his graduate student helped design all the energy systems; they took 5th place in engineering for the world-wide competition.

Jim Oliver continued to lead Iowa State’s Virtual Reality Applications Center and the Human Computer Interaction graduate program. His research is supported by a variety of industry partners and federal agencies, and VRAC supports a broad interdisciplinary constituency that spans the entire university.

Pranav Shrotiya was promoted to Associate Professor with tenure in July 2009. Over the last year, research results from his group were reported in three journal publications, three invited lectures, and four peer-reviewed conference proceedings.

Gloria Starns continued to lead collaborations across multiple colleges to understand and apply techniques that will improve the ability of students to solve complex problems. Her work led to experimentally implementing ThinkSpace, a tool that helps researchers understand where in the process of problem solving, complexity begins to thwart students in their efforts to find solutions to complex problems, in some mechanical engineering courses.

Shankar Subramaniam, who directs the ME department’s research program on complex fluid systems, organized a one-day workshop on Complex Fluid Systems at Iowa State that brought together researchers from all departments and colleges at the university to establish collaborations and pursue large collaborative research funding opportunities in the area of complex fluid systems. He is part of team proposal to study the rheology of cement using numerical simulation and experiments with Professor Kejin Wang (CCEE) and Professor Sriram Sundararajan (ME) that was funded by the National Science Foundation.

Sriram Sundararajan has helped advance the graduate program by deploying a new coursework-only professional master’s degree, streamlining coursework requirements for graduate degrees, and increasing involvement of women in graduate programs. He was also elected to the steering committee of the International Conference on Wear of Materials.

Judy Vance
Joseph and Elizabeth Anderlik
Professor of Engineering

Jonathan Wickert
Dean, College of Engineering
James and Katherine Melsa
Professor in Engineering
Professor, Department of Mechanical Engineering

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

Professor Wickert’s research interests include mechanical vibration and noise control, continuous and multibody systems dynamics, applied mechanics, applications in computer data storage, flexible web material manufacturing, and friction-vibration interaction.

Xinwei Wang
Associate Professor

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

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

Professor Wang’s areas of interests are 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.

Song Zhang
Assistant Professor

BS, Precision Machinery & Precision Instrumentations, University of Science & Technology of China, 1994
MS, Mechanical Engineering, Stony Brook University, 2003
PhD, Mechanical Engineering, Stony Brook University, 2005

Professor Zhang researches three-dimensional optical metrology, machine and computer vision, virtual reality, human-computer interaction, nondestructive evaluation, and biometrics.

Faculty Highlights
Judy Vance, along with several co-authors, received a best paper award from the American Society of Mechanical Engineers (ASME) Design Engineering Division Mechanisms and Robotics Committee at the International Design Engineering Conferences held in San Diego. Her research using haptics, or force feedback, to enhance virtual reality to produce realistic virtual assembly simulations continues to be supported with funding from the National Science Foundation. She remains active in supporting women engineering faculty as they explore academic leadership opportunities as evidenced by her activities as a member of the ASME Broadening Participation Committee.

Xinwei Wang’s Micro/Nanoscale Thermal Science Laboratory has been developing high-efficiency and cost-effective micro wind turbines. The project is funded by the California Energy Commission and it aims to develop micro wind turbine arrays based on the revolutionary technology Wind Annulus Nozzle Distributor (WAND). The proposed WAND-based micro wind turbine array technology will benefit the public significantly in terms of reducing CO2 emission, reducing the dependence on coal and oil for electricity generation, and reducing family electrical bills.

Research in Eliot Winer’s lab focusing on allowing enhanced exploration of digital medical data has been transitioned into a commercial product. It is currently being used at a major U.S. hospital for planning radiation oncology treatments and organ transplant procedures. Dr. Winer was on research teams that attracted more than $1.5M in new funding to Iowa State.

Judy Vance, along with several co-authors, received a best paper award from the American Society of Mechanical Engineers (ASME) Design Engineering Division Mechanisms and Robotics Committee at the International Design Engineering Conferences held in San Diego. Her research using haptics, or force feedback, to enhance virtual reality to produce realistic virtual assembly simulations continues to be supported with funding from the National Science Foundation. She remains active in supporting women engineering faculty as they explore academic leadership opportunities as evidenced by her activities as a member of the ASME Broadening Participation Committee.

Eliot Winer
Associate Professor

BS, Aeronautical and Astronautical Engineering, The Ohio State University, 1992
MS, Mechanical Engineering, State University of New York at Buffalo, 1994
PhD, Mechanical Engineering, State University of New York at Buffalo, 1999

Song Zhang
Assistant Professor

BS, Precision Machinery & Precision Instrumentations, University of Science & Technology of China, 1994
MS, Mechanical Engineering, Stony Brook University, 2003
PhD, Mechanical Engineering, Stony Brook University, 2005

Professor Zhang researches three-dimensional optical metrology, machine and computer vision, virtual reality, human-computer interaction, nondestructive evaluation, and biometrics.
Senior Lecturers

Emmanuel Agba, Gloria Starns

Emeritus Faculty

- Shyam Bahadur
- William Bathie
- Joseph R. Baumgarten
- Gerald Colver
- William Cook
- Richard Danofsky
- Paul DeLong
- Arvid Eide
- Max Gassman
- Jerry L. Hall
- Alexander Henkin
- Alfred Joenssen
- George Junkhan

Adjunct and Courtesy Appointments

- Ashraf Bastawros, Adjunct Associate Professor (Aerospace Engineering)
- Joseph N. Gray, Adjunct Associate Professor (Physicist, Center for Nondestructive Evaluation)
- John McClelland, Adjunct Associate Professor (Senior Physicist, Ames Laboratory)
- Richard Stone, Courtesy Assistant Professor (Industrial and Manufacturing Systems Engineering)

Research Sponsors

- Aesculap
- Air Force Office of Scientific Research
- Ames Lab
- Battelle Infrastructure and Platform Grants Program
- California Energy Commission
- Conoco-Phillips
- Defense Threat Reduction Agency
- Department of Energy
- Department of Homeland Security
- DuctSox Corporation
- Fisher Control
- Grow Iowa Values Fund
- Iowa Energy Center
- Iowa Power Fund
- Institute for Physical Research and Technology, Iowa State
- John Deere
- Midwest Forensics Resources Center
- NASA
- National Institute of Health
- National Institute of Justice
- National Research Council
- National Science Foundation
- NineSigma
- Omaha Public Power District
- Office of Naval Research
- Pioneer
- Provost Office, Iowa State
- Rockwell-Collins
- Sokang University, South Korea
- US Army
- Winegard Company
- NineSigma
- Ames Lab
- Battelle Infrastructure and Platform Grants Program
- California Energy Commission
- Conoco-Phillips
- Defense Threat Reduction Agency
- Department of Energy
- Department of Homeland Security
- DuctSox Corporation
- Fisher Control
- Grow Iowa Values Fund
- Iowa Energy Center
- Iowa Power Fund
- Institute for Physical Research and Technology, Iowa State

Lecturers

Sebastien Feve, Matt Hagge, Jim Heise

Journal Publications


Kalyanasundaram, D., P. Shhotriya, and P. Molian, "Obtaining a Relationship Between Process


Sections or Chapters in Books, Monographs, or Similar Volumes


Conference Proceedings


elastic-propulsion Interactions”, American Control Conference, St. Louis, MO, June 10–12, 2009.


* Best Paper Award

Patent Awarded

Thomas C. Waite and Atul G. Kelkar
Issued November 24, 2009
Active Noise Control System
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

Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, 3680 Beardshear Hall, 515 294-7612.