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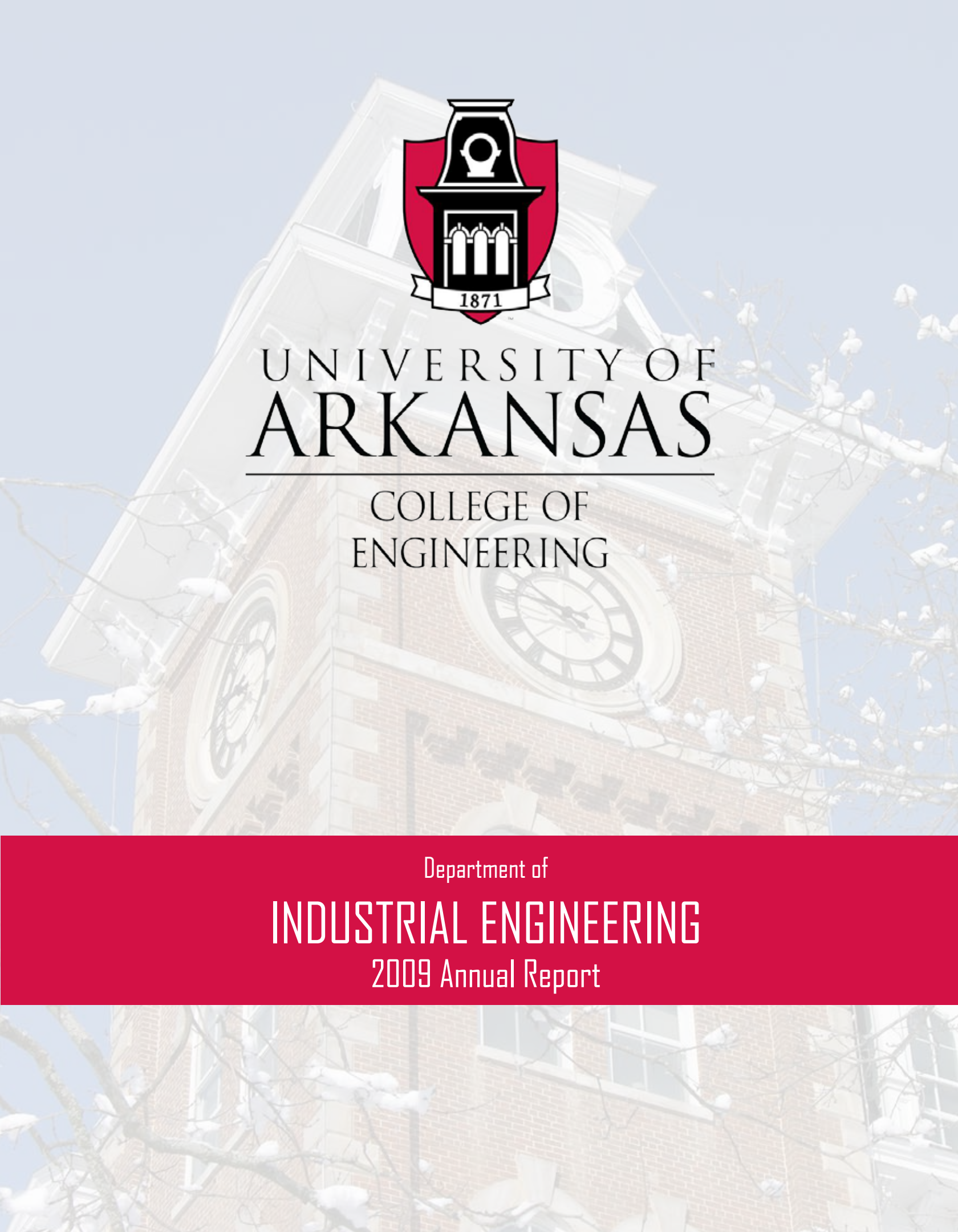


UNIVERSITY OF
ARKANSAS

COLLEGE OF
ENGINEERING

Department of

INDUSTRIAL ENGINEERING

2009 Annual Report

CONTENTS

Inside cover and cover photos courtesy of Alex Mironoff.

FROM THE DEPARTMENT HEAD

Dr. Needy's research interests include engineering management, engineering economic analysis, sustainable engineering and integrated resource management. She teaches courses in engineering management. She joined the faculty in 2008.

Education:
Ph.D. (Wichita State University)
M.S.I.E. (University of Pittsburgh)
B.S.I.E. (University of Pittsburgh)

Dear Colleagues:

Greetings! I am pleased to report another successful year. The Department continues to make progress in developing its new five-year strategic plan which will be rolled-out in fall 2010. Forming the foundation of this plan are five separate, but integrated objectives in undergraduate education, graduate education, research, service and department visibility. This strategic plan will create a shared vision to guide both our short-term and long-term decision making.

Early in 2009, the department completed a faculty search for two tenure-track faculty positions. Chase Rainwater, Ph.D. from the University of Florida, joined the department in fall 2009 and Ashlea Bennett, Ph.D. from Georgia Tech, will join the department in spring 2010. In addition, the department oversaw cases for four faculty members seeking tenure and/or promotion. An undergraduate curriculum reform was undertaken to provide students with greater flexibility to pursue minors, co-op and study abroad. Recruitment into our undergraduate program remains very strong with rising enrollments. Efforts were intensified to recruit high quality graduate students and faculty members traveled to El Salvador and Turkey for recruitment activities. U.S.-based institutions are being targeted for next year. In addition, our Master of Science in Operations Management (MSOM) program celebrated its 35th Anniversary with record-level enrollments. Research funding for the year exceeded $2M!

This report highlights many achievements of our talented faculty, staff, students and alumni over the past year. In addition, it focuses on the Department's major thrust areas for which we are best known, namely transportation & logistics, healthcare systems, and quality control & reliability engineering. Highlights of a few of the significant research accomplishments in these areas are shared.

In closing, I hope that you will enjoy examining our year in review and are confident that you will be impressed with what you see. We invite you to contact us for further information or even better yet, stop by for a visit. You will like what you see!

Warmly,

Kim LaScola Needy

Kim LaScola Needy, Ph.D., P.E., CFPIM
Department Head and
21st Century Professor of Industrial Engineering

FACULTY

Nebil Buyurgan, Ph.D., Assistant Professor

Dr. Buyurgan's research interests include Auto-ID technologies; RFID system optimization and data quality assessment; inventory control and management; auctioning methods; distributed control of large-scale systems; modeling and control of discrete event systems; modeling and analysis of flexible manufacturing systems; and automation and integration of advanced manufacturing systems. Dr. Buyurgan teaches courses in manufacturing design, processes and system analysis. He joined the faculty in 2004.

Education:
Ph.D. (University of Missouri - Rolla)
M.S.E.M. (University of Missouri - Rolla)
B.S.I.E. (Istanbul Technical University)

C. Richard Cassady, Ph.D., Professor

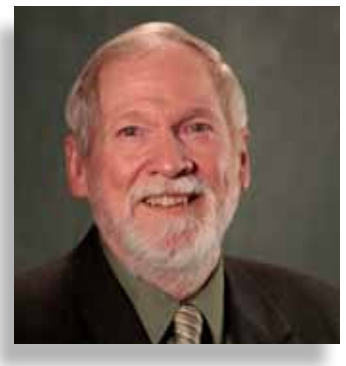
Dr. Cassady serves as Director of Freshman Engineering for the College of Engineering. His primary research interests lie in repairable systems modeling. He also conducts research in the areas of reliability engineering, statistical quality control and sports applications of operations research. Dr. Cassady teaches courses in reliability and maintainability engineering, operations research, probability and statistics, and statistical quality control. He joined the faculty in 2000.

Education:
Ph.D. (Virginia Tech)
M.S.I.S.E. (Virginia Tech)
B.S.I.S.E. (Virginia Tech)

Justin R. Chimka, Ph.D., Associate Professor

Dr. Chimka's research interests include categorical data analysis, inventory control, statistical quality control, survival analysis and time series. He teaches courses in applied statistics, generalized linear models, optimization and production. Dr. Chimka joined the faculty in 2002.

Education:
Ph.D. (University of Pittsburgh)
M.S.I.E. (University of Pittsburgh)
B.S.I.E. (University of Pittsburgh)

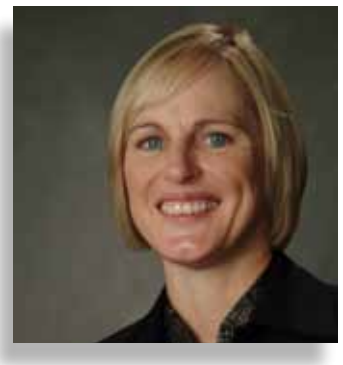


Earnest W. Fant, Ph.D., P.E., Associate Professor

Dr. Fant's research interests include applications for machine-visioned robotics in automated production/processing and material handling systems and the application of operations research to in-plant logistics systems and warehousing. He teaches courses in robotics, machine vision, automated systems and renewable energy. Dr. Fant joined the faculty in 1988.

Education:
Ph.D. (Texas Tech)
M.S.I.E. (Southern Methodist University)
B.S.I.E. (University of Arkansas)

Carol S. Gattis, Ph.D.,
Adjunct Associate Professor



Dr. Gattis has been responsible for undergraduate student recruitment and taught courses in statistics, work methods and measurement, and engineering economics. She is currently the Director of Recruitment, Retention, Honors and Diversity for the College of Engineering. Dr. Gattis joined the faculty in 1991.

Education:
Ph.D. Engineering (University of Arkansas)
M.S.E.E. (University of Arkansas)
B.S.E.E. (University of Arkansas)

Steven L. Johnson, Ph.D., P.E., CPE.,
Professor

Dr. Johnson's research interests have spanned the continuum from occupational ergonomics (e.g., hand tool design, reduction of musculoskeletal disorders, development of computer-based job analysis systems) to in-vehicle information, communication and entertainment systems in commercial trucks and automobiles. His current research involves modeling driver workload, evaluating lane-departure systems and investigating the effect of heavy truck/automobile speed differentials on highway safety, efficiency and economics. He teaches courses in human factors engineering/ergonomics, quality control and design of experiments. Dr. Johnson joined the faculty in 1982.

Education:
Ph.D. (SUNY at Buffalo)
M.S. Human Factors (University of Illinois)
B.A. Psychology (University of South Dakota)

Scott J. Mason, Ph.D.,
Associate Professor and Associate Department Head

Dr. Mason serves as the Chair of Graduate Studies and began serving as Associate Department Head in 2004. His research interests include production planning and control; scheduling; and large-scale system optimization, modeling and algorithms, with emphasis on semiconductor manufacturing and transportation logistics. Dr. Mason teaches courses in industrial engineering design, sequencing and scheduling, and in the modeling and analysis of semiconductor manufacturing. He joined the faculty in 2000.

Education:
Ph.D. (Arizona State University)
M.S.E. (The University of Texas)
B.S.M.E. (The University of Texas)

Russell D. Meller, Ph.D.,
Professor

Dr. Meller is Hefley Professor of Logistics and Entrepreneurship and serves as the Director of the Center for Excellence in Logistics and Distribution (CELDi) and the Deputy Director of the Center for Innovation in Healthcare Logistics (CIHL). His research interests include facility logistics, facility layout, material handling, logistics system design and operations research applications to healthcare logistics. Dr. Meller teaches courses in facility logistics and material handling. He joined the faculty in 2005.

Education:
Ph.D. (University of Michigan)
M.S.I.O.E. (University of Michigan)
B.S.I.O.E. (University of Michigan)

Heather Nachtmann, Ph.D., Associate Professor

Dr. Nachtmann serves as the Director of the Mack-Blackwell Rural Transportation Center. Her research interests include economic decision analysis, cost estimation, intermodal transportation networks and engineering education. Dr. Nachtmann teaches courses in the areas of engineering economy, cost and financial engineering, and operations research. She joined the faculty in 2000.

Education:
Ph.D. (University of Pittsburgh)
M.S.I.E. (University of Pittsburgh)
B.S.I.E. (University of Pittsburgh)

Chang S. Nam, Ph.D., CHFP, Assistant Professor

Dr. Nam's research interests include haptic virtual environments, brain-computer interface, neuroergonomics, and organizational cognitive neuroscience. Dr. Nam teaches courses in human factors and ergonomics. He joined the faculty in 2004.

Education:
Ph.D. (Virginia Tech)
M.S.I.E. (SUNY at Buffalo)
M.A.B.A. (Sogang University)
B.S.I.E. (SungKyunKwan University)

Edward A. Pohl, Ph.D., Associate Professor

Dr. Pohl's research interests include repairable systems, large-scale systems engineering and analysis, probabilistic design, risk and reliability, and engineering optimization. He teaches courses in quality control, engineering statistics, non-linear programming, heuristics, risk modeling, systems engineering and management. He serves as Director and Chair of Studies for the Operations Management Program and currently holds the John L. Imhoff Chair. Dr. Pohl joined the faculty in 2004.

Education:
Ph.D. (University of Arizona)
M.S. Reliability Engineering (University of Arizona)
M.S. Systems Engineering (Air Force Institute of Technology)
M.S. Engineering Management (University of Dayton)
B.S.E.E. (Boston University)

Chase Rainwater, Ph.D., Assistant Professor

Dr. Rainwater's research interests lie in the areas of large-scale optimization, integer programming and supply chain logistics. In addition, he conducts research in areas of healthcare planning, homeland security and reliability. Dr. Rainwater teaches courses in probability and statistics, optimization and decision support systems. He joined the faculty in 2009.

Education:
Ph.D. (University of Florida)
B.S.I.E. (University of Arkansas)

Ronald L. Rardin, Ph.D., Distinguished Professor

Dr. Rardin is the inaugural holder of the John and Mary Lib White Systems Integration Chair in Industrial Engineering. His research and teaching interests center on large-scale optimization modeling and algorithms, including their application in healthcare delivery, transportation and logistics, and energy planning. Dr. Rardin joined the faculty in early 2007 and directs the Center for Innovation in Healthcare Logistics in collaboration with industrial partners and healthcare providers.

Education:
Ph.D. (Georgia Institute of Technology)
M.P.A. Municipal Administration (University of Kansas)
B.A. Mathematics/Political Science (University of Kansas)

Sarah E. Root, Ph.D., Assistant Professor

Dr. Root's research interests are in defining, modeling, and solving applied large-scale optimization problems. She is particularly interested in the application of optimization tools to problems encountered in healthcare and logistics. She teaches courses in operations research and service systems engineering. Dr. Root joined the faculty in 2007.

Education:
Ph.D. (University of Michigan)
B.S.I.E. (University of Pittsburgh)

Manuel D. Rossetti, Ph.D., PE., Associate Professor

Dr. Rossetti serves as the Chair of Undergraduate Studies. His research is focused on the design, analysis and optimization of transportation, inventory, healthcare and manufacturing systems, using stochastic modeling, computer simulation, information systems and heuristic modeling techniques. He teaches courses in the areas of probability modeling, discrete event simulation, object-oriented and database systems, transportation/logistics modeling, and inventory modeling. Dr. Rossetti joined the faculty in 1999.

Education:
Ph.D. (The Ohio State University)
M.S.I.S.E. (The Ohio State University)
B.S.I.E. (University of Cincinnati)

John A. White, Ph.D., PE., Distinguished Professor & Chancellor Emeritus

After serving for eleven years as Chancellor of the University of Arkansas, Dr. White joined the faculty of the Department of Industrial Engineering full-time in 2009. A distinguished alumnus of the department, Dr. White teaches engineering economics, facilities planning, and queueing systems.

Education:
Ph.D. (The Ohio State University)
M.S.I.S.E. (Virginia Tech)
B.S.I.E. (University of Arkansas)
Dr. White also holds honorary doctorates from the Katholieke Universitiet of Leuven in Belgium and George Washington University.

RESEARCH

The University of Arkansas has a longstanding tradition of conducting advanced research and offering educational programs in the area of transportation & logistics. Through participation in the Center for Excellence in Logistics and Distribution (CELDi) our department has received millions of dollars for industry-funded research on a wide range of issues related to logistics engineering and transportation. The department also receives substantial funding for transportation and logistics research from the Mack-Blackwell Rural Transportation Center (MBTC).

CELDi: On the Path from Good to Great!

Innovation is the driving principle for the Center for Excellence in Logistics and Distribution (CELDi), headquartered at the University of Arkansas. How to resupply electrical plants more effectively? How to change business practices in order to simultaneously lower inventories **and** out-of-stock events? How to design a next-generation distribution center? How to forecast events that seldom occur so that these events don't disrupt the logistics and distribution system? How to enable decision-making when data are critical, but missing?

These are some of the questions that CELDi researchers at the University of Arkansas answered while partnering with **Arkansas Electric Cooperatives Corporation, Invistics, Medline Industries, Red River Army Depot, Sam's Club, The Learning Chameleon, and Wal-Mart Stores** on applied, year-long research projects. This year's projects resulted in innovative solutions for logistics and distribution excellence, with more than one success story that affected bottom line performance.

CELDi is a partnership between the National Science Foundation (NSF), ten major research universities, and more than 30 member organizations in commercial, military and government sectors of the economy. Throughout 2009 researchers in CELDi worked to fulfill the center's mission of enabling member organizations to achieve logistics and distribution excellence by delivering meaningful, innovative and implementable solutions that provide a return on investment. Research endeavors at CELDi are driven and sponsored by the

member organizations, which specialize in distribution, transportation, manufacturing, information technology, and software solutions. CELDi also sponsored projects in education, such as the popular IE Challenge, that directly benefit this region's middle and high school students and teachers by bringing science and engineering into the classroom.

In 2009 Center Director Dr. Russell D. Meller led the CELDi Site Directors and staff through an intensive strategic planning initiative. The initiative outlines a plan for growth and a vision of going from "Good to Great" by:

1. Increasing CELDi name recognition in order to facilitate growth and assist in the marketing efforts to attract new members at each of the CELDi sites.
2. Leveraging the substantial collective research expertise of the Center that uniquely qualifies it to secure and conduct large-scale, multi-institutional grants.
3. Developing educational short courses that are

based on the prior research successes of the Center in order to educate our member organizations, provide a context for research conducted in the Center, and attract new members to CELDi.

In order to achieve this vision, the following five strategic initiatives were launched: (1) A comprehensive communications and marketing plan; (2) A short-course program that is driven by member organization input; (3) A set of initiatives to increase meaningful member-student interactions; (4) A plan to secure large-scale, multi-institutional grants; (5) A focused member university recruiting effort to deepen and broaden the expertise of CELDi.

The success of CELDi's program for growth will be measured by the impact of its research, the value created through the synergy of its member organizations and member universities, and ultimately, the professional success of all personnel involved in its endeavors. As CELDi has laid the foundation for these initiatives with the participation and support of the CELDi members, university partners and the leadership at the NSF, we look forward to developing more exciting opportunities for CELDi students, researchers and members. New CELDi members and universities are always welcome.

Material Handling Teachers Institute

The department was very excited to host and help sponsor the 2009 Material Handling Teachers Institute (MHTI). MHTI is made possible through generous funding provided by the College Industry Council on Material Handling Education (CICMHE) – a division of the Material Handling Industry of America (MHIA). This bi-annual event attracts faculty at all levels of experience who teach material handling, facilities design/layout/logistics, operations, and supply chain courses. The main objective of MHTI is to improve the teaching of these courses at both the undergraduate and graduate levels. In addition, the event provides a wonderful opportunity for networking. Dr. Russell D. Meller coordinated the 2009 event on behalf of the department and CICMHE. There were over 50 people in attendance including 23 faculty participants and 30 speakers from both academia and industry.

The four-day event was held on the U of A campus in Fayetteville, and included tours of the Wal-Mart Distribution Center and Hiram Walker where automated guided vehicles (AGVs) are being utilized. Attendees were also able to tour the RFID Research Center at the U of A which holds the distinction of being the only EPCglobal Accredited Performance Test Center at an academic institution. Several distinguished experts served as keynote speakers including Jim Apple, Jr. (The Progress Group - Retired), John A. White, III (Partner & Exec. Vice President of Fortna, Inc.), John A. White, Jr. (Distinguished Professor and Chancellor Emeritus, University of Arkansas), and Gary Maxwell (Senior Vice President Global Supply Chain at Wal-Mart Stores, Incorporated).

2009 Material Handling Teachers Institute

This event allowed the department to showcase its rich array of resources to the outside community and represents another example of how the department is providing a valuable service to the Industrial Engineering community through the integration of teaching and research.

Center for Innovation in Healthcare Logistics

The Center for Innovation in Healthcare Logistics (CIHL) is an industry-university partnership leading a nationwide effort to identify and foster systemic adoption of ground-breaking healthcare supply chain and logistic innovations. The Center targets supply chain and material flow aspects of healthcare operations that can be addressed with improved information and logistics systems/processes. CIHL is industry funded at $600K+ annually for 5 years starting May, 2007. Primary funding comes from strategic partners Wal-Mart, Arkansas Blue Cross Blue Shield, and the VHA hospital network. Other collaborators provide further resources, expertise and test sites. They include AHRMM (Association for Healthcare Resource & Materials Management), SMI (Strategic Marketplace Initiative), GS1 Healthcare US, Proctor & Gamble, IBM, and collaborating hospital partners. The Center was led in 2009 by Professor Ron Rardin, Director, and Professor Russell D. Meller, Deputy Director. Five

other faculty members are currently engaged in active research projects, along with a Strategic Collaboration Director, an Administrative Support Supervisor, between 5 and 7 Graduate Research Assistants, and 2 Postdoctoral Fellows.

Despite breath-taking advancements in medical research, healthcare supply chains and logistics are often tangled, wasteful and outdated by comparison to those in other industries. After wages and benefits, materials and supply chains are the second greatest expense in healthcare – accounting for perhaps 30% of total hospital expenditures. Of equal importance is the fact that supply chain and logistic mechanisms have direct implications for the safety and quality of patient care. Thus, they offer a rich target for significant improvements, using industrial and systems engineering as well as related tools from information systems.

Seeking to avoid the "one off" single-site successes that too often go unadopted elsewhere, CIHL projects investigate system-wide opportunities that can be scaled and replicated for a host of supply chain partners. Activities during 2009 have centered on the following projects:

- "Identifying Opportunities for Cost & Quality Improvements in Healthcare Logistics" (PI Dr. Heather Nachtmann, CoPI Dr. Ed Pohl, with AHRMM) conducts systematic surveys of healthcare logistics professionals to update and expand assessments of the cost savings and quality improvements available in different parts of healthcare supply chains. The goal is to both guide future CIHL project selections and to raise the profile of healthcare supply operations, which too often receive little attention or investment from hospital executives, by documenting the magnitude of available opportunities. Preliminary results were reported in a major 2009 report, *The State of Healthcare Logistics*. The project is expected to continue into 2011.

- "Provider Adoption of GS1 Standards for Product and Location Identification" (PI Dr. Ron Rardin, CoPI Dr. Nebil Buyurgan investigates the costs and benefits to hospitals of adopting new GS1 global standard numbering systems for products and supply chain partners similar to those used in retail for decades. Although goals have been set for near-term implementation of the standards across the healthcare industry, the vast majority of hospital providers are uninformed and unprepared to begin adoption. This project has conducted pilot implementations at two collaborating hospital systems to collect data on the opportunities inherent in adopting GS1 standards, to identify the barriers that must be overcome, and to clarify how implementation can be simplified into a sequence of more easily absorbed steps. Beginning in 2009, findings have been presented at professional meetings to hundreds of interested healthcare provider leaders. Written reports and extensions into new areas will follow in 2010 and 2011.

MACK-BLACKWELL
Rural Transportation Center

The Mack-Blackwell Rural Transportation Center (MBTC) operates as a U.S. Department of Transportation (DOT) University Transportation Center and a member of the National Transportation Security Center of Excellence (NTSCOE) of the U.S. Department of Homeland Security (DHS). In June 2009, Dr. Letitia (Tish) Pohl joined MBTC as the Assistant Director of its NTSCOE program. Dr. Letitia Pohl completed her Ph.D. in Industrial Engineering from the University of Arkansas and works closely with MBTC's director, Dr. Heather Nachtmann, in project administration, external proposal writing and research execution related to the mission of the program.

Industrial Engineering faculty played an active role in MBTC's DOT research program this year. Drs. Scott Mason and Edward Pohl were awarded a new project entitled "Network Design Analysis for Special Needs Student Services." This project is an extension of previous work and is one of the first studies that specifically focus

on special needs student services and busing. Dr. Sarah Root was funded to develop a three-credit graduate course on large-scale optimization with specific focus on transportation and logistics systems. This course will help equip our graduate students for positions in the transportation and logistics industries, as well as enable

them to conduct high-quality research on transportation and logistics systems. Drs. Heather Nachtmann and Edward Pohl completed a project on “Emergency Response via Inland Waterways” that investigates the feasibility of using inland waterway transportation to provide emergency medical response to catastrophic events. Their research confirmed that most Arkansas counties show a potential benefit from waterway medical services, while some counties show a need, but lack inland waterway access. Future research will include expanding the scope of the project to other types of emergency response.

On the DHS side, there are several projects led by Industrial Engineering faculty. In 2009 Dr. Heather Nachtmann and Dr. Letitia Pohl, MBTC Assistant Director, began working on a new project entitled “Sustaining Resilient Inland Waterways via Renewable Energy” that focuses on how inland water transportation can play an important role in the Nation’s sustainability effort. Drs. Ed Pohl, Scott Mason and Chase Rainwater continued their work on “Designing Resilient and Sustainable Supply Chain Networks.” Their research explores the resiliency and sustainability of supply chain systems, both individually and collectively. Dr. Justin Chimka continued work on “Information Enhancement Among Aviation Security Partners.” This project is identifying models of usual general aviation activity that can be used to detect potential attacks and develop reporting standards. Dr. Manuel Rossetti completed his research “Simulating Transportation Models in Large-Scale Evacuation Scenarios.” His project examined the movement of people and resources into and out of a geographic area that is either under threat of a disaster/attack or has just experienced such an incident. Dr. Rossetti’s test case investigated the state-of-the-art in simulation-based evacuation modeling and increased our knowledge of better human behavior modeling in the multi-modal transportation connection. It also successfully addressed a general procedure for modeling evacuation in a large shopping district. Areas for further study include evacuation strategies, parking lot modeling and pedestrian modeling.

Homeland Security

Human-Computer Interaction (HCI)

Dr. Chang S. Nam is leading a research effort in the area of Human-Computer Interaction (HCI) with the goal of better understanding how humans interact with complex systems. This HCI initiative, which began in 2005, includes both basic and applied research in human factors and ergonomics engineering issues, associated with design, development and evaluation of human-centered technologies. Established research thrusts include Brain-Computer Interface and Neuroergonomics (BCI/NE), Haptic Audio Virtual Environment (HAVE), and Cognitive Ergonomics (CE).

Brain-Computer Interface and Neuroergonomics (BCI/NE): Brain-Computer Interface is a novel and promising communication channel for people with severe physical disabilities - people for example, those who have experienced brainstem stroke or suffer from cerebral palsy. Dr. Nam’s research team works in several areas within this field, including the study of noninvasive methods to monitor and obtain brain signals; effective signal processing methods that extract signal features; innovative algorithms that translate these features into device commands; and the development and evaluation of potential applications to aid with communication such as selecting letters or icons.

Haptic Audio Virtual Environment (HAVE): Research into the haptic audio virtual environment (HAVE), a haptically-mediated virtual world that interfaces with the user via the sense of touch, addresses two problems: the shortage of students studying in the areas of science, technology, engineering and mathematics (STEM); and specifically, the lack of access to STEM areas by persons with disabilities. The National Science Foundation has interest in this area and is funding Dr. Nam’s research.

Cognitive Ergonomics (CE): CE research focuses on the fit between human cognitive abilities/limitations and the machine/task environment. Dr. Nam’s research in this area is supported by the Air Force Research Laboratory, the Air Force Office of Scientific Research, the Mack-Blackwell Transportation Center and the Arkansas Highway Transportation Department.

PUBLICATIONS

In 2009 the faculty of the Department of Industrial Engineering at the University of Arkansas published four books, contributed one book chapter, published 30 refereed journal articles, 34 other refereed publications, made 22 contributions to unrefereed publications and proceedings, and offered 41 invited lectures and oral presentations. The department authors are indicated in bold face type.

Textbooks

Asfahl, C. Ray, and David W. Rieske. *Industrial Safety and Health Management*, 6th Edition. New Jersey: Prentice Hall, 2009.

Rossetti, M. D., *Simulation Modeling and Arena.* New York, NY: John Wiley & Sons, 2009.

Rossetti, M. D., R. R. Hill, B. Johansson, A. Dunkin, and R. G. Ingalls. "The Proceedings of the 2009 Winter Simulation Conference", *Institute of Electrical and Electronics Engineers*. Piscataway, New Jersey: December 2009.

White, J. A., K.E. Case, and D.B. Pratt. *Principles of Engineering Economic Analysis.* New York, NY: John Wiley & Sons, January 2009.

Chapters in Textbooks or Handbooks

Hill, R., and **E. A. Pohl**. "Chapter 9", *An Overview of Meta-Heuristics and Their Use in Military Modeling*, edited by Marlin Thomas and Adeji B. Badiru, 9-1 to 9-25. Taylor and Francis/CRC Press, 2009.

Refereed Journal Articles

Lehlou, N., **N. Buyurgan**, and **J. R. Chimka**, "An Online RFID Laboratory Learning Environment." *IEEE Transactions on Learning Technologies*, Special Issue on Remote Laboratories, Vol. 2, No.4 (2009): 295-303

Buyurgan, N., B. C. Hardgrave, J. Lo, and R. T. Walker, "RFID in Healthcare: A Framework for Uses and Opportunities." *International Journal of Advanced Pervasive and Ubiquitous Computing*, Vol. 1, No.1 (2009): 1-25

Buyurgan, N., **H. Nachtmann**, and S. Celikkol, "A Model for Integrated Implementation of Activity Based Costing and Radio Frequency Identification Technology in Manufacturing." *International Journal of RF Technologies: Research and Applications*, Vol. 1, No. 2 (2009): 114-130

Maillart, L. M., **C. R. Cassady**, **C. Rainwater**, and K. Schneider, "Selective Maintenance Decision-Making over Extended Planning Horizons." *IEEE Transactions on Reliability*, Vol. 58, No. 3 (2009): 462-469

Chimka, J. R., "Gamma regressive individuals control charts for influenza activity." *Quality Engineering*, Vol. 21, No. 2 (2009): 182-189

Chimka, J. R., and L. Walker, "Threshold autoregressive individuals control charts." *Economic Quality Control*, Vol. 24, No. 1 (2009): 55-73

Chimka, J. R., and Q. Wang, "Accelerated failure time models of graduation." *Educational Research & Reviews*, Vol. 4, No. 5 (2009): 267-271

Chimka, J. R., and H. Wolfe, "History of ordinal variables before 1980." *Scientific Research & Essays*, Vol. 4, No. 9 (2009): 853-860

Soerens, T., and **C. Gattis**, "Global Community Development Village network: An Interdisciplinary International Service Learning Model," *International Journal for Service Learning in Engineering*, Vol. 4, No. 2, (October 2009)

Mason, S. J., S. Jin, and J. Jampani, "A moving block heuristic to minimize earliness and tardiness costs on parallel machines." *International Journal of Production Research*, Vol. 47, No. 19, (2009): 5377-5390

Magableh, G. M., and **S. J. Mason**, "An integrated supply chain model with dynamic flow and replenishment requirements." *Journal of Simulation*, Vol. 3 (2009): 84-94

Jia, J., and **S. J. Mason**, "Semiconductor manufacturing scheduling of jobs containing multiple orders on identical parallel machines." *International Journal of Production Research*, Vol. 47, No.10 (2009): 2565-2585

- Gue, K. R., and **R. D. Meller**, "Aisle Configurations for Unit-Load Warehouses." *IIE Transactions on Design & Manufacturing*, Vol. 41, No. 3 (April 2009): 171-182

Parikh, P. J., and **R. D. Meller**, "Estimating Picker Blocking in a Wide-Aisle Order Picking System." *IIE Transactions on Design & Manufacturing*, Vol. 41, No. 3 (April 2009): 232-246

Pohl, L. M., **R. D. Meller**, and K. R. Gue, "An Analysis of Dual-Command Operations in Common Warehouse Designs." *Transportation Research Part E: Logistics and Transportation Review*, Vol. 45E, No. 3 (May 2009): 367-379

Pohl, L. M., **R. D. Meller**, and K. R. Gue, "Optimizing Fishbone Aisles for Dual-Command Operations in a Warehouse." *Naval Research Logistics*, Vol. 56, No. 5 (June 2009): 389-403

Konomi, S., and **C. S. Nam**, "Supporting Collaborative Privacy-Observant Information Sharing Using RFID-Tagged Objects." *Advances in Human-Computer Interaction*, Vol. 2009 (2009): 1-13

Jeong, M., I. Lee, D. Lee, **C. S. Nam**, and K. Park, "Board Attributes and Firm Performance: Revisiting Board's Roles." *Korean Journal of Management*, Vol. 17, No. 2 (2009): 195-228

Nam, C. S., J. B. Lyons, H. Hwang, and S. Kim, "The Process of Team Communication in Multi-Cultural Contexts: An Empirical Study Using Bales' Interaction Process Analysis (IPA)." *International Journal of Industrial Ergonomics*, Vol. 39, No. 5 (2009): 771-782

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Lehlou, N., **N. Buyurgan**, and **J. R. Chimka**, "An Online RFID Laboratory Environment and the Assessment of its User's Education." *ASEE Annual Conference Proceedings*, Austin, TX, May 2009

Buyurgan, N., A. Hajiyev, N. Lehlou, **M. D. Rossetti**, **R. Rardin**, and R. Jayaraman, "Portable Equipment Management in Hospitals." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May, 2009

Cassady, C. R., "An Introduction to Probabilistic Methods in Reliability and Maintainability." *Tutorial Notes of the Reliability and Maintainability Symposium*, San Jose, CA, January 2009

Sullivan, K. M., and **C. R. Cassady**, "The CMS+ System for Ranking College Football Teams." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May, 2009

Cassady, C. R., and S. W. Mulvenon, "Initial Analysis of Freshman-to-Sophomore Retention in a New First-Year Engineering Program." *Proceedings of the ASEE Annual Conference & Exhibition*, Austin, TX, June 2009

Schneider, K., H. A. Schluterman, and **C. R. Cassady**, "A First-Year Experience Course Sequence for Engineering Students at the University of Arkansas." *Proceedings of the Midwest Section Conference of the American Society for Engineering Education*, Lincoln, NE, September 2009

Fant, E., "Human Aspects in the Introduction of industrial Robots." *Proceedings of the 30th annual ASEM National Conference*, Springfield, MO, October 2009

Chenoweth, M., and **E. Fant**, "Six Sigma Qualification of Smart Camera Inspection." *Proceedings of the 30th annual ASEM National Conference*, Springfield, MO, October 2009

Wasson, J., and **E. Fant**, "Implementation and Validation of Machine Vision and Smart Camera Systems." *Proceedings of the 30th annual ASEM National Conference*, Springfield, MO, October 2009

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Johnson, S. L., "Managing Ergonomics Course Projects in Operational Facilities So That Everyone Benefits." *Proceedings of the Human Factor and Ergonomics Society Annual Meeting*, San Antonio, TX, October 2009

Bogle, B. M., and **S. J. Mason**, "Optimizing Demand Fulfillment from Test Bins." *Proceedings of the Winter Simulation Conference*, M. D. Rossetti, R. R. Hill, B. Johansson, A. Dunkin and R. G. Ingalls, eds., Austin, TX, 2009

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McCallion, E. A., N. D. Taylor, **S. J. Mason**, and **E. A. Pohl**, "Analysis of Transportation Network Design Strategies for Forced Transfer Busing." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, 2009

Montgomery, W., and **S. J. Mason**, "Mission Assignment and Leave Block Scheduling: Maintaining Readiness and Sustainment of Military Troops During War-Time." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, 2009

Pohl, L.M., **R. D. Meller,** and K. R. Gue, "Optimal Storage Strategies for Dual-Command Warehouses." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May 2009

Smith, B. K., **H. Nachtmann**, **E. A. Pohl**, and J. R. Townsley, "Management Initiatives in Healthcare Logistics." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May-June 2009

- Smith, B. K., **H. Nachtmann**, and **E. A. Pohl**, "Improving Healthcare Supply Chain Processes via Data Standardization." *Proceedings of the American Society of Engineering Management Conference*, Springfield, MO, October 2009

Li, Y., **C. S. Nam**, and Y-G Choo, "Towards Optimizing P300 Speller Matrix Design While Decreasing Human Error." *Proceedings of the International Ergonomics Association Conference*, Beijing, China, 2009

Yamaguchi, T., S. Johnson, H. N. Kim, Y. Li, **C. S. Nam**, and T. L. Smith-Jackson, "Haptic Science Learning System

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Scala, N. M., **K. L. Needy**, and J. Rajgopal, "Decision Making and Tradeoffs in the Management of Spare Parts Inventory at Utilities." *Proceedings of the American Society for Engineering Management Conference*, Springfield, MO, 2009

Claypool, E., B. Norman, and **K. L. Needy**, "Incorporating Risk into a Design for Supply Chain Model." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, 2009

Scala, N. M., J. Rajgopal, and **K. L. Needy**, "Risk and spare parts inventory in electric utilities." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, 2009

Turan, F. K., N. M. Scala, M. Besterfield-Sacre, and **K. L. Needy**, "An analytic network process (ANP) approach to the project portfolio management for organizational sustainability." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, 2009

Yeung, T., and **E. A. Pohl**, "Introduction to Optimization Methods in Reliability and Maintainability." *Tutorial Notes, Reliability and Maintainability Symposium*, Ft. Worth, TX, January 2009

Balya, R., and **E. A. Pohl**, "Resource Allocation in a Project Management Setting Based on Schedule Reliability." *Proceedings of the American Society of Engineering Management Conference*, Springfield, MO, October 2009

Burbano, A., B. Saka, **R. Rardin**, and **M. D. Rossetti**, "Technology Assessment for an Inventory Management Process in a Hospital Unit." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May 2009

Aouam, T., and **R. Rardin**, "Robust Strategies for Natural Gas Procurement." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May 2009

Medal, H., **M. D. Rossetti**, V. Varghese, and **E. A. Pohl**, "An Intermittent Demand Inventory Analysis Tool." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May 2009

Rossetti, M. D., and Y. Liu, "Simulating SKU Proliferation in a Health Care Supply Chain." *Proceedings of the Winter Simulation Conference*, Austin, TX, Dec. 2009

Varghese, V., and **M. D. Rossetti**, "A Meta Forecasting Methodology for Large Scale Inventory Systems with Intermittent Demand." *Proceedings of the Industrial Engineering Research Conference,* Miami, FL, May 2009

Unlu, Y., and **M. D. Rossetti**, "Evaluating the Lead Time Demand Distribution for (r, Q) Policies Under Intermittent Demand." *Proceedings of the Industrial Engineering Research Conference*, Miami, FL, May 2009

◆ *Best Paper Award*

GRANTS

During 2009, the following research grants were active. Project PIs are indicated in bold face type.

Buyurgan, Nebil, and Justin Chimka, National Science Foundation, $149,709, “Integrated Auto-ID Technology for Multidisciplinary Undergraduate Studies (I-ATMUS),” 2007-2010

Cassady, Richard and Edward Pohl, National Science Foundation/CELDi, $20,000, “Research Experiences for Teachers,” 2005-2010

Chimka, Justin, Wal-Mart Stores/CELDi, $45,000, “Supply Chain Transformation,” 2009

Chimka, Justin, Department of Homeland Security, $130,147, “Information Enhancement Among Aviation Security Partners,” 2009-2010

Chimka, Justin, Arkansas Biosciences Institute, $36,997, “Developing Quality Control Standards to Evaluate Microarray Studies,” 2009-2010

Fant, Earnest, and Nebil Buyurgan, Red River Army Depot/CELDi, $50,000, “Robotic Kitting of Rubber Products**”** 2009-2010

Fant, Earnest, and Nebil Buyurgan, Red River Army Depot/CELDi, $45,000, “Logistics Charting Using Time Series, Balanced Score Card,” 2008-2009

Hall, Kevin, and Heather Nachtmann, Department of Homeland Security, $404,846, “Mack-Blackwell Transportation Center National Transportation Security Center of Excellence,” 2008-2012

Mason, Scott, National Science Foundation/CELDi, $25,000, “Collaborative Research: A TIE Research Program on e-Design for Design of Supply Chain,” 2007-2009

Mason, Scott and Edward Pohl, Department of Transportation, $46,340, “Improving Forced Transfer and Special Needs Busing in Rural Public Schools,” 2008-2009

Mason, Scott and Edward Pohl, Department of Transportation, $50,000, “Network Design Analysis for Special Needs Student Services,” 2009-2010

Mason, Scott, Arkansas Department of Higher Education, $3,900.00, “Optimizing Piped Water Routing & Decentralized Water Unit Locations,” 2009

Mason, Scott, Edward Pohl, and Sarah Root, National Science Foundation, $72,837.00, “Collaborative Research,: Ensuring Continuity of Care: A Quantification of Risk in the Healthcare Supply Chain,” 2009-2011

Mason, Scott, Sarah Root, and Russell Meller, Sam’s Club/CELDi, $45,000, “Assessment of Vendor Contract Impacts on Retail Logistics,” 2008-2009

Meller, Russell, National Science Foundation, $835,016.16, “CELDi Center Administration,” 2002-2009

Meller, Russell, National Science Foundation, $238,797, “Designing Distribution Centers for a Service Economy,” 2006-2011

Meller, Russell, National Science Foundation, $221,973, “A Sequence-pair and MIP-Based Facility Layout Algorithm,” 2006-2009

Meller, Russell, National Science Foundation, $23,920, “An Engineering Virtual Organization for Discrete-Event Logistics Systems,” 2007-2010

Meller, Russell, National Science Foundation, $6000, “REU: Designing Distribution Centers for a Service Economy,” 2008-2009

Meller, Russell, Medline/CELDi, $45,000, “Distribution Center Configuration Models,” 2009-2010

Nachtmann, Heather, and Edward Pohl, Mack-Blackwell Transportation Center, $30,095 , “Emergency Response Via Inland Waterways”, 2008-2009

Nachtmann, Heather, and Letitia Pohl, U.S. Department of Homeland Security, Borders and Maritime Security Division, $100,000, “Renewable Energy for Inland Waterways,” 2009-2010

Nachtmann, Heather, Kevin Hall, and Jack Buffington, Mack-Blackwell Transportation Center, $328,097, “Administrative NRTSC Project,” 2007-2011

Nachtmann, Heather, and Kevin Hall, U.S. Department of Transportation, $9,390, “NTRSC-Mack-Blackwell

Transportation Center Professional Advisory Board," 2007-2011

Nachtmann, Heather, and Kevin Hall, U.S. Department of Transportation, $22,596, "Technology Transfer Project," 2007-2011

Nachtmann, Heather, Department of Transportation, $20,314, "Independent Graduate Student Support," 2009-2010

Nam, Chang, and Tonya Smith-Jackson, National Science Foundation, $570,028, "I FEEL SCIENCE: Innovative Flexible Experimental Environment for Learning in SCIENCE," 2007-2011

Nam, Chang, and Tonya Smith-Jackson, National Science Foundation, $99,750, "REU Supp: Research Experiences to Design for Inclusion," 2009-2011

Needy, Kim, and Robert Ries (Univ. Florida), Construction Industry Institute, $210,753 (total), "Quality Management in the Capital Facilities Delivery Industry – A Best Practices Refreshment," 2007-2009

Needy, Kim, and Bryan A. Norman (Univ. of Pittsburgh), National Science Foundation/Center for e-Design, $50,000, "Collaborative Research: A TIE Research Program on e-Design for Design for Supply Chain," 2007-2010

Pohl, Edward, Scott Mason, and Chase Rainwater, Department of Homeland Security, $150,000, "Designing Resilient and Sustainable Supply Chain Networks," 2009-2010

Pohl, Edward, Air Force Research Laboratories/CELDi, $133,560, "Decision Support for Logistics Response to Chemical, Biological, or Radiological Attacks," 2006-2009

Pohl, Edward and Justin Chimka, Learning Chameleon/CELDi, $45,000, "The Learning Chameleon," 2009-2011

Rardin, Ronald, Russell Meller, Scott Mason, Nebil Buyurgan, Manuel Rossetti, Heather Nachtmann, and Edward Pohl. Corporate and professional sponsors of the Center for Innovation in Healthcare Logistics total $3,175,000, (All projects), 2007-2012

Rardin, Ronald, National Science Foundation, $121,213, "Optimization of Intensity Modulated Radiation Therapy with Time Varying," 2008-2010

Root, Sarah and Chase Rainwater, Arkansas Electric Cooperative Corp., $45,000, "Transportation Network Modeling," 2009-2010

Root, Sarah, Mack-Blackwell Rural Transportation Center, $23,416, "Development of Large-Scale Transportation Course," 2009-2010

Root, Sarah, Sam's Club/CELDi, $45,000, "Improving Retail Logistics," 2009-2010

Rossetti, Manuel and Edward Pohl, National Science Foundation, $40,000, "An Intermittent Demand Forecasting Tool," 2008-2010

Rossetti, Manuel, Invistics Corporation/CELDi, $90,000, "Inventory Models for Intermittent Highly Variable Demand and Safety Stock Adjustments to Meet Desired Service Level Requirements," 2008-2011

Rossetti, Manuel, Department of Homeland Security, $50,000, "Simulating Transportation Modes in Large-Scale Evacuation Scenarios," 2009-2010

UNDERGRADUATE PROGRAM

Overview

The goal of the Industrial Engineering Undergraduate Program at the University of Arkansas is to prepare men and women for professional careers and graduate studies in Industrial Engineering. We provide a foundation in mathematics, science, the humanities and social sciences, engineering science, and engineering design in order to produce Industrial Engineers with the intellectual, technical, and professional competence to develop, implement and manage industrial engineering solutions to complex industrial, governmental and societal problems.

Our program includes opportunities for study abroad, an optional cooperative work program and an honors program for qualified students. The study abroad program is administered through the Office of Study Abroad and International Exchange. The John L. Imhoff Global Studies Endowment supports academic scholarships that help defray expenses incurred by industrial engineering students engaged in for-credit overseas study and/or an overseas work experience (internship or cooperative work program).

The aim of the University's cooperative education program is to provide interested students with opportunities to complement their engineering education with degree-related work experience. The work experience provides participants with opportunities to apply what they have learned in the classroom and to interact with experienced industrial engineers. Participants also gain insights into the industrial engineering profession that help them define their educational and career goals. In recent years, students from our department have participated in cooperative work experiences at ABF Freight System, Inc., Ayrshire Electronics, Black & Decker, Hawker-Beechcraft, Intel Corporation, J.B. Hunt Transport, Lockheed Martin, Pratt & Whitney, Rheem Manufacturing, and other major employers.

The Industrial Engineering Honors Experience is designed for industrial engineering students who are also enrolled in the University of Arkansas Honors College.

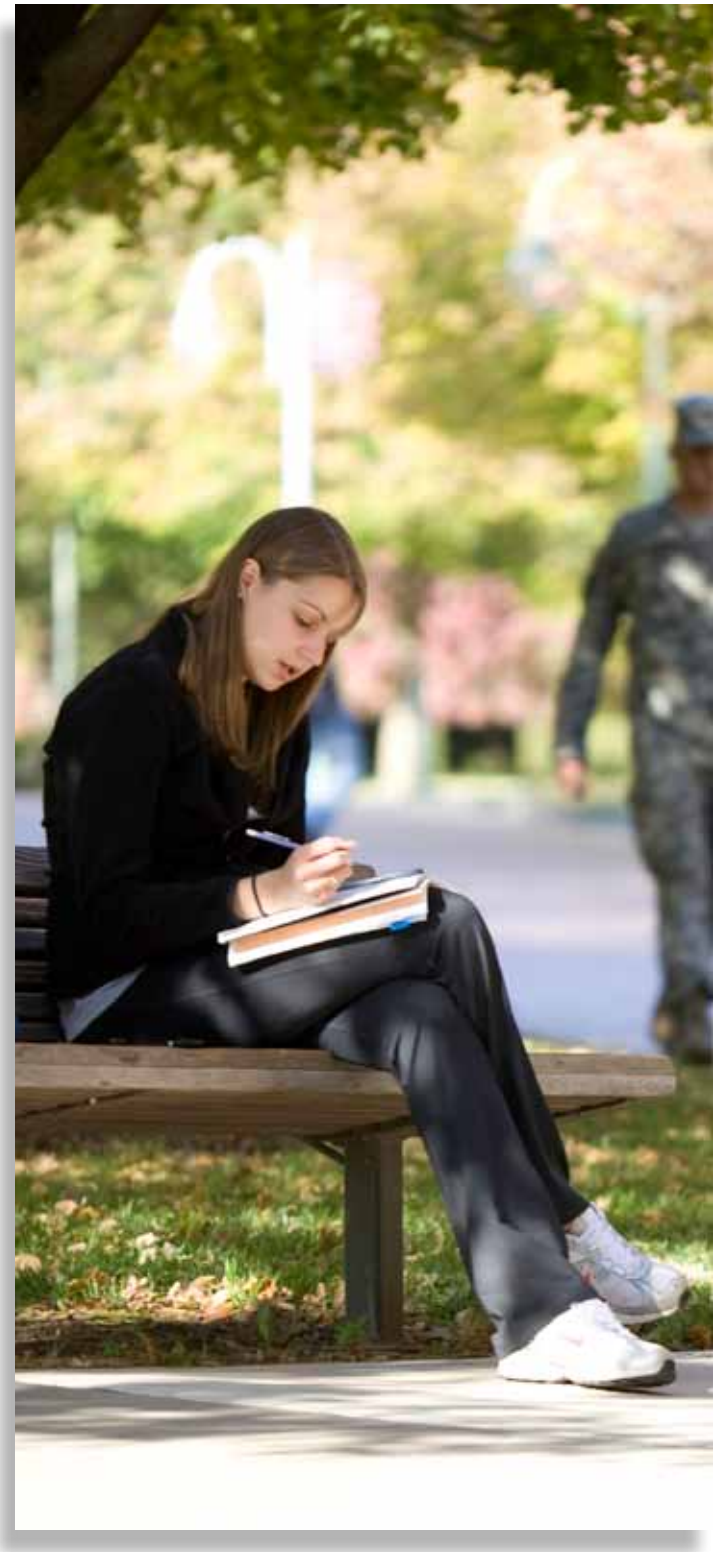


Photo courtesy of Alex Mironoff

The program gives honors students the opportunity to pursue unique coursework and research experiences. The program requires a minimum of 12 hours of honors engineering courses, an undergraduate research experience and a written thesis.

Dr. Nebil Buyurgan serves as the Chair of Undergraduate Studies. More information on the undergraduate program can be found at: http://www.ineg.uark.edu/3536.php

In the fall of 2009, 165 students were enrolled in our undergraduate program. The enrollment has increased slightly since the Freshman Engineering (FE) Program was implemented two years earlier. The program continues to be directed by Dr. Richard Cassady of our department. The FE Program provides a common academic foundation in engineering to all incoming freshmen before allowing them to major in a specific engineering discipline.

Highlights

Members of the class of 2009 were hired by nationally recognized companies such as Wal-Mart Inc., Boeing, Pratt and Whitney, JB Hunt, and Tyson Foods. At least 13 offers were made to 10 of our graduates with an average starting salary of $54,200 (high $62,000). A number of students chose to remain at the University of Arkansas for graduate studies in Industrial Engineering and Business Administration.

The Department continues to report successes within professional societies and through personal achievements. This year the Alpha Pi Mu (APM) chapter (faculty advisor Dr. Heather Nachtmann) received the Outstanding Chapter Award from the executive council of the national organization. Undergraduate student Becca Carlson was the recipient of the APM National Scholarship in 2009. The Student Chapter of the Institute of Industrial Engineers (IIE) at the University of Arkansas (faculty advisor Dr. Justin Chimka) once again received the Frank F. Groseclose Gold Award. In addition, undergraduate students Coby Durham, Troy Long and Brittany Bogle were recipients of scholarships sponsored by IIE.

In April 2009, 24 IE students received various departmental and named scholarships. The total dollar value of these scholarships exceeded $47,000, including $28,000 provided by the Arkansas Academy of Industrial Engineers (AAIE).

Undergraduate student Mattie Bookhout was elected as the Associated Student Government (ASG) President. The ASG at the University of Arkansas is a student-led organization that acts as an organized voice for all students and strives to effectively represent them in University policy-setting and decision-making while promoting citizenship on campus and in the greater community.

GRADUATE PROGRAM

Overview

The Graduate course offerings of the Industrial Engineering Department, as well as research opportunities for graduate students, continue to grow and diversify. A sampling of the published work of our graduate students, highlighted in this section, illustrates the range of research interests they are pursuing under the guidance of our faculty. Also featured below is our professional graduate program in Operations Management.

For students pursuing graduate studies in the field of industrial engineering we offer several options in terms of degrees, areas of specialization, and full-time or part-time studies.

Graduate degrees for on-campus students are offered in two areas:

- **Master of Science in Industrial Engineering (M.S.I.E.)**
- **Doctor of Philosophy in Engineering (Ph.D.)**

In addition to the traditional degree options, the Industrial Engineering Department also offers the following non-traditional degree program:

- **Master of Science in Operations Management (M.S.O.M.)**

Our faculty's wide range of expertise provides opportunities for study in a variety of areas, such as:

- Reliability, Maintainability, & Quality Engineering
- Transportation, Logistics, & Distribution
- Healthcare Systems Engineering
- Manufacturing & Automation
- Human Factors & Ergonomics
- Engineering Management

These areas continue to be supported by research centers and laboratories, such as:

- Center for Excellence in Logistics and Distribution
- Mack Blackwell Rural Transportation Center

Photo courtesy of Alex Mironoff

- Center for Innovation in Healthcare Logistics
- Human Computer Interaction Laboratory
- Renewable Energy Laboratory

Dr. Manuel D. Rossetti serves as the Chair of Graduate Studies. More information about admission requirements and degree programs can be found at www.ineg.uark.edu/3534.php

Highlights

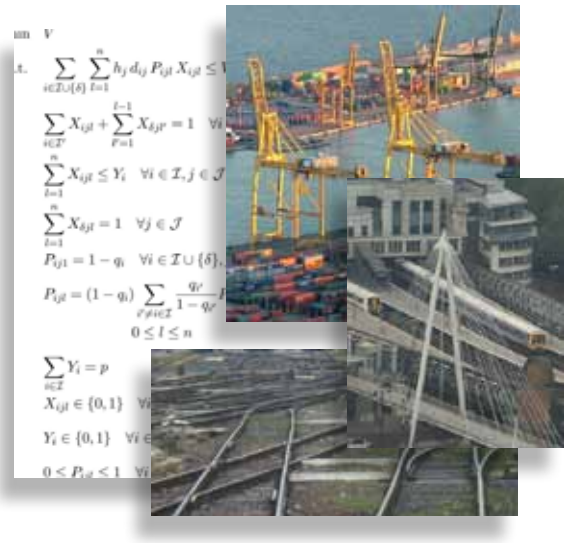
The University of Arkansas is the only institution in the state ranked in the first tier of national universities in America's Best Colleges. At the department-level we are pleased to report that in 2009 our graduate program was ranked 26th by *U.S. News & World Report*. During the reporting period, more than 450 students were enrolled in our graduate programs (24 Ph.D. students and 16 Master's students, as well as 415 students enrolled in the Operations Management graduate program). The students who entered our graduate program in the fall of 2009 had the following average GRE scores: MS 1269 and Ph.D. 1271. Approximately 95% of all on-campus graduate students received some sort of financial assistance from the department through graduate research assistantships.

The Graduate Studies Committee has undertaken an aggressive initiative to increase recruitment of top-notch graduate students in key targeted areas. Recently,

efforts have been focused in Central America, namely El Salvador, Turkey and in targeted U.S.-based programs. A major overhaul of the departmental web page has been completed to support recruitment efforts and raise departmental visibility.

Our graduate students gained recognition, awards and honors in 2009 and published or presented their research in several major venues. Industrial Engineering graduate students presented their work at the Industrial Engineering Research Conference held in Miami this past May, the INFORMS Conference held in San Diego this past October, and at the ASEM Conference held in Springfield this past October.

In 2009, the Mack-Blackwell Rural Transportation Center selected Ph.D. student Hugh Medal as the Outstanding Student of the Year in recognition of his outstanding scholarship and exceptional academic skills. Hugh, who is working under the supervision of Drs. Ed Pohl, Chase Rainwater and Scott Mason, is working to design resilient supply chain networks. The team is developing mathematical models to determine which transportation infrastructure elements (ports, bridges, tunnels, rail terminals) within



a supply chain are most critical. Upon graduation, he plans to pursue a career in academia. Hugh further distinguished himself by being one of twenty students nationwide to be selected to present their research at the Fourth Annual Department of Homeland Security (DHS) University Network Summit in Washington, DC.

The Material Handling Education Foundation awarded several scholarships to our top students: Zeynep Kirkizoglu received the $3,000 Rack Manufacturers Honor Scholarship; Jennifer Pazour received the $9,000 Ray Gibson Memorial Scholarship; and Lisa Thomas received the $2,500 Rid-U-Rak Honor Scholarship.

Operations Management Master's Program

In 2009 the Master of Science program in Operations Management, under the leadership of Dr. Ed Pohl, celebrated its 35th anniversary as a hybrid, live and distance-learning degree program that primarily serves working professionals from business/industry and the military. Since its inception in 1974, the program has

Photo courtesy of Alex Mironoff

At last summer's Operations Management Curriculum Review, Department Chair Dr. Kim Needy (left) listens as Dr. Donald King (right) of the Fayetteville-based OM faculty makes a point regarding his Organization and Control course and Instructor Mickey Yeager of Millington, TN (center) records the group's decisions.

graduated over 4500 participants. Despite the economic recession, the program continued to grow in 2009. With 517 students enrolled in the fall semester of 2009, Operations Management continues to hold the distinction of being the largest graduate program at the University of Arkansas.

A cursory comparison of the program today **vs.** 35 years ago yields the following data:

- Six Graduate Residence Centers plus a thriving distance segment **vs.** three program sites.
- A twenty-three course curriculum plus four undergraduate prerequisites **vs.** an eighteen course curriculum
- Over 200 graduates **vs.** 68
- Over 3000 course enrollments **vs.** 1090
- Over $2.3M in revenue **vs.** $212K

In August 2009, the Operations Management Program held a major curriculum review which resulted in the reassessment and updating of most course descriptions, objectives and textbooks. Faculty from the Fayetteville main campus, including newly appointed Department Chair Dr. Kim Needy, and from residence centers across the country spent several days revising course content to conform to the latest developments in academic research and industry practices.

The Operations Management program is designed for the working student who typically holds a professional or management position in an organizational setting, be it business, military, non-profit, or governmental. Program content focuses squarely on the concepts, methods, and tools that are essential to the successful management of work processes, projects, and people in a wide spectrum of organizations. The curriculum grows out of an Industrial Engineering perspective on the science of management and equips graduates to carry out their managerial responsibilities both more efficiently and more effectively. The curriculum is presented both by Industrial Engineering faculty and by academically qualified business professionals who have accrued extensive managerial and industry experience in the specific subjects they teach.

Operations Management coursework emphasizes the acquisition of practical knowledge in areas such as project management, economic decision-making, supply chain management, human behavior analysis, quality management, and operations research, as well as many other areas of importance to today's manager. Students are able to select from over 20 courses to make up the ten required to complete the degree.

The independent study component of the program emphasizes action or applied research, rather than the formal research that is typical of most traditional graduate programs. Several specific paths through the course material are offered, providing concentrations in Industrial Management, Business Management, Human Resource Management, or Health & Safety Management. Students come to the program from three primary sources: the business world, the armed forces, and undergraduate academic programs. The corporate affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Sam's Club, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and Pratt & Whitney.

In addition to evening classes, held on the University of Arkansas Fayetteville campus, live instruction is provided at five other graduate residence centers: Naval Support Activity Mid-South in Millington, TN; Little Rock Air Force Base in Jacksonville, AR; the Air Force Special Operations base at Hurlburt Field, FL; SAU Tech in Camden, AR; and ANC University Center in Blytheville, AR. While all program sites offer live classes, for added flexibility many courses are available online.

Photo courtesy of Alex Mironoff

More information about the Operations Management Program can be found at **www.msom.uark.edu**.

FACULTY SERVICE AND ACHIEVEMENTS

The Department of Industrial Engineering has had another prosperous year despite the current economic challenges. The Department completed a faculty search early in 2009 for two tenure-track faculty positions. Two exceptional candidates were selected; Chase Rainwater, who achieved his Ph.D. from the University of Florida and Ashlea Bennett, who completed her Ph.D. from Georgia Tech. Dr. Bennett's appointment was deferred until early 2010.

Manuel D. Rossetti, P.E. and associate professor in industrial engineering, published a new John Wiley & Sons textbook titled 'Simulation Modeling and Arena' in the area of discrete event simulation modeling. This is a textbook for a first course in discrete-event simulation modeling and analysis for upper-level undergraduate students as well as entering graduate students. The text is focused towards engineering students, but it may also be utilized by advanced business majors, computer science majors, and other disciplines where simulation is practiced.

Dr. Heather Nachtmann and Dr. Ed Pohl were featured in the March 2009 cover story for Materials Management in Health Care/Management Health Solutions. The article, "The industry's take on data standards: Survey reveals thoughts on standards, adoption timeline" focused on their research in conjunction with the Association of Healthcare Resource and Materials Management (AHRMM) to conduct a survey of supply chain professionals on the progress of data standards adoption. Their findings from the Cost and Quality in Healthcare Logistics Survey was presented at the AHRMM conference in Tampa, FL

A paper written by Dr. Steve Johnson, industrial engineering professor, was selected for inclusion in Best of Human Factors: Thirty Classic Contributions to Human Factors/Ergonomics Science and Engineering. The article, "What Moves, the Airplane or the World," reported Dr. Johnson's research on motion relationships in aircraft cockpit displays and controls. Thirty articles were selected as being highly cited and valued, as well as having a measurable impact on the field. More than 2,800 papers published in the 50-year history of Human Factors: The Journal of the Human Factors and Ergonomics Society were considered. The Best of Human Factors book serves as a historical resource for human factors and ergonomics professionals, a compendium of readings for graduate-level education, and a means to introduce the field of human factors/ergonomics to anyone with an interest in improving the human-system interface.

Dr. Russell D. Meller, Hefley Professor of Logistics and Entrepreneurship and also director of the Center for Excellence in Logistics and Distribution was named an Institute of Industrial Engineering (IIE) Fellow in 2009. This prestigious honor is given to individuals for professional leadership and outstanding contributions to industrial engineering. In addition, Dr. Meller and co-creator, Dr. Kevin Gue of Auburn University shared the Technical Innovation in Industrial Engineering Award. The recipient of this annual award is described as the industrial engineer that is responsible for an innovation that substantially benefits the profession. Dr. Meller was selected, along with his research colleague, because of their research related to innovative warehouse aisle designs.

Dr. Richard Cassady, Professor in Industrial Engineering and Director of the College of Engineering's Freshman Engineering Program, was one of fifty academicians selected to participate in the inaugural Frontiers of Engineering Education, sponsored by the National Academy of Engineering. The nation's brightest young engineering researchers and educators were selected to take part in this symposium. Engineering faculty members in the first half of their careers who are developing and implementing innovative educational approaches in a variety of disciplines came together to share ideas, learn from research and best practice in education, and leave with a charter to bring about improvement in their home institution. Dr. Cassady's innovative Freshman Engineering Program aims to increase retention of freshmen engineering students by providing proactive support to new engineering students through summer orientation, peer mentoring, tutoring, academic and career advising, personal counseling and academic success strategy training.

Dr. Scott Mason was one of seven faculty members from the University of Arkansas to be awarded a 2009 Faculty Gold Medal. Faculty Gold Medals are awarded to members of the university faculty who demonstrate a commitment to investing their expertise and intellectual vigor in their students' scholastic ambitions and goals. The faculty members mentored students who won state and nationally competitive honors in the past academic year, including scholarships, fellowships, competitions and research grants.

Dr. Ernie Fant is creating a Renewable Energy Laboratory within the department and through a partnership with Ozarks Electric Cooperative has developed a solar photovoltaic systems seminar. This initiative complements the University-led effort to develop an undergraduate minor in Sustainability and the College of Engineering's effort to develop a graduate certificate in Sustainable Energy.

Dr. Heather Nachtmann was selected as the John L. Imhoff Chair in Industrial Engineering for a two-year period beginning in January 2010. She is the third recipient to hold this title. She plans to make significant contributions in three key areas: service to students, teaching excellence, and faculty development.

Department Head Kim LaScola Needy was the recipient of the ASEE Engineering Management Division's 2009 Bernard R. Sarchet Award. This is the highest award of the Engineering Management Division for recognizing a lifetime achievement in engineering management education. This award, named after one of the founding fathers of the academic discipline of engineering management, is awarded annually to an individual who has made significant contributions over an extended period of time to the discipline and the Division and who exemplifies the highest standards of the professorate in engineering management.

Buyurgan, N.

- Associate Editor, *International Journal of RF Technologies*
- Review Board, *Journal of Materials and Manufacturing Processes*

Cassady, C.R.

- Program Chair, Vice General Chair, Secretary of the Board of Directors, Annual Reliability and Maintainability Symposium
- Scholarship Trustee, Institute of Industrial Engineers
- Associate Editor, *Journal of Risk and Reliability*

Chimka, J.R.

- Member, Best Student Paper Committee, INFORMS Quality, Statistics and Reliability
- Session Chair, INFORMS Quality, Statistics and Reliability
- Newsletter Editor, *INFORMS Quality, Statistics and Reliability*
- Advisor, UA Student Chapter Institute of Industrial Engineers
- Member, Editorial Board, *International Journal of Quality Engineering and Technology*

Johnson, S.L.

- Member, Board of Certification for Professional Ergonomists (BCPE) Exam Committee
- Member, Transportation Research Board Truck and Bus Safety Data Subcommittee
- Friend, Transportation Research Board Truck and Bus Safety Committee
- Friend, Transportation Research Board Truck Industry Research Committee (ATO60)

Mason, S.J.

- Program Chair, 2009 Modeling and Analysis of Semiconductor Manufacturing Conference
- Associate Editor, *IEEE Transactions on Electronics Manufacturing Packaging*

Meller, R.D.

- Education Liaison to Board of Governors, Material Handling Industry of America
- Department Editor, *IIE Transactions on Design & Manufacturing*
- Editorial Board Member, *Journal of Manufacturing Systems*
- Editorial Board Member, *Transportation Research Part E: Logistics and Transportation Review*
- Member, 2010 International Material Handling Research Colloquium Planning Committee
- Member, 2009 *IIE Transactions* Best Paper Committee

Nachtmann, H.

- 2010 Conference Technical Program Co-Chair, American Society for Engineering Management
- Member, American Society for Engineering Education – National Engineering Economy Teaching Excellence Award Committee
- Member, Arkansas State Highway and Transportation Department's Advisory Council for Transportation Research
- Program Chair, American Society for Engineering Education – Engineering Economy Division
- Secretary/Treasurer, American Society for Engineering Education – Engineering Economy Division
- Area Editor, *The Engineering Economist*

Nam, C.S.

- Editorial Board, *eMinds: International Journal on Human-Computer Interaction*

- Editorial Board, *The Journal of Information Technology Education*
- Member of Program Board, International Conference on Human-Computer Interaction
- International Program Committee, The IASTED International Conference on Human-Computer Interaction (IASTED-HCI)
- International Program Committee, The IASTED International Conference on Education and Technology (IASTED-ICET)
- Session Organizer and Chair, International Conference on Human-Computer Interaction
- Guest Editor-In-Chief, *International Journal of Human-Computer Interaction*

Needy, K.L.

- Member of the Council of Industrial Engineering Academic Department Heads (CIEADH) for the Institute of Industrial Engineers (IIE)
- President from Nov 2008 - Oct 2009, then Past-President from Nov 2009 - Oct 2010, of the American Society for Engineering Management
- 2010 Conference Technical Program Co-Chair, American Society for Engineering Management
- Book Editor, *The Engineering Economist*
- Associate Editor, *Engineering Management Journal*

Pohl, E.A.

- Associate Editor, *Journal of Risk and Reliability*
- Associate Editor, *The Journal of Military Operations Research*
- Past-President, Military Applications Section, INFORMS
- Awards Committee Chair, Military Applications Section, INFORMS
- Conference Management Committee, Reliability and Maintainability Symposium 2009
- 2010 Conference Chair American Society for Engineering Management

Rainwater, C.E.

- Organizing Committee Member, INFORMS (Southern Region)

Rardin, R.L.

- Award Committee – Pritsker Dissertation Award, Institute of Industrial Engineers
- Award Committee – Best Paper of *IIE Transactions* on Operation Engineering
- Associate Editor, *Operations Research*
- Associate Editor, *International Journal of Information Systems in the Service Sector*

Rossetti, M.D.

- Proceedings Co-Editor, Winter Simulation Conference
- Associate Editor, *International Journal of Modeling and Simulation*
- National Science Foundation SBIR Phase 1 and 2 Panel Reviewer

White, J.A.

- Chair, Alan T. Waterman Award Committee, National Science Foundation

RESEARCH~TEACHING LABORATORIES

Our research and teaching facilities continue to expand through the addition of new laboratories, as well as through procurement of additional equipment and enhancement of existing equipment in all our laboratories.

David D. and Nancy J. Foust Computation Laboratory

The David D. and Nancy J. Foust Computation Laboratory is a state-of-the-art, interactive teaching facility made possible by a generous donation by Mr. and Mrs. Foust in 2002. Students have 24-hour access to 30 workstations, all equipped with the latest software designed for the execution of Industrial Engineering

projects. The lab is equipped with a plasma-screen display along with projection equipment to facilitate instruction, software demonstrations, and design presentations. There is also space within the lab for students to use when working on their design projects.

Ergonomics Laboratory

The Ergonomics Laboratory supports both research and teaching in the field of ergonomics. The laboratory houses equipment used to measure the physical, physiological and psychological dimensions of human performance. The laboratory is used by both graduate and undergraduate students as part of the industrial engineering curriculum. In addition, both graduate and undergraduate students use the laboratory to conduct their thesis research.

A STISM driving simulator and an iViewX eye motion monitoring system were recently acquired for the laboratory. This equipment provides the opportunity to conduct research on a variety of topics related to improving the safety of driving both automobile and heavy trucks. The iViewX eye motion monitoring system has a variety of research applications such as the evaluation of driver distraction and workload when using different in-vehicle navigation configurations.

Larry and Gwen Stephens Undergraduate Research Laboratory

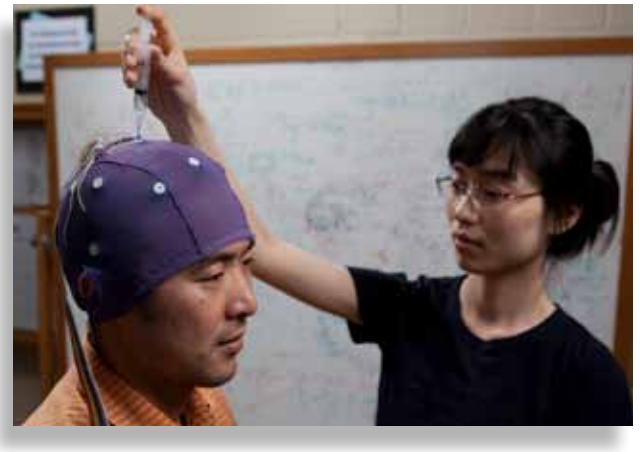
The Larry and Gwen Stephens Undergraduate Research Laboratory is a research facility made possible by a generous donation from Mr. and Mrs. Larry Stephens in 2006. It is designed to support the research projects of undergraduate students in the Industrial Engineering

department. This initiative stems from the University's commitment to promote research at all academic levels.

The lab houses 15 undergraduate student researchers supported by their faculty advisors. Students engaged in research are assigned desk space in the lab for up to three regular semesters and issued wireless laptops to aid in their investigations. Most of the student researchers attend classes together and have collaborated on class projects, which lends the lab a collegial atmosphere in which ideas and methods can be shared, tested and refined.

Human-Computer Interaction Laboratory

Dr. Chang S. Nam established the Human-Computer Interaction (HCI) Laboratory for the purpose of studying how individuals interact with complex information systems. The HCI lab is being used for both basic and applied research. Established research areas include new

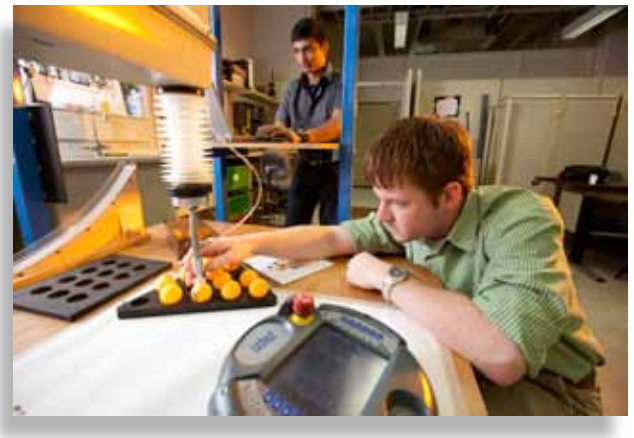


approaches to brain-computer interface (BCI), cognitive ergonomics, haptic audio virtual environments (HAVEs), adaptive and intelligent human-computer interaction, and ubiquitous computing. The lab is used for instructional purposes in courses on the subjects of human information processing and human computer interaction, as well as in an advanced human factors course.

Manufacturing Automation Laboratory

The Manufacturing Automation Laboratory houses three new Adept robotic arms (a six-axis articulating arm, a two-axis linear module and a four-axis SCARA with a four-camera machine vision system), an IBM SCARA robotic arm/machine vision work cell with conveyor, and a new Southworth lift table. This equipment is used for both instructional and research purposes. Recently, Dr. Earnest Fant combined the two-axis linear module with the six-axis articulating arm such that the latter could be carried in an inverted position to any location within a range of 1200mm to 1800mm. Both robots use the same controller and programming, but different power supplies. An electric-hydraulic scissor table can lift projects within the reach of the six-axis articulating arm as the arm lowers itself to the project below. Machine vision can also be incorporated into the new work cell. The new Adept SCARA robotic arm with an Automated Temperature Measurement system and touch screen panel computer for system control has been modified so that other research and instructional projects can be performed by students.

There is a new stand-alone machine vision work cell with several new lighting sources and fixed, variable and telecentric optics for Cognex, PPT, and Banner



Engineering smart cameras to perform research and to introduce students to this technology.

In 2009, a portion of the laboratory space was converted into office space for three graduate students. In addition to carrying out research, these graduate students conducted undergraduate laboratory sessions in robotics and machine vision throughout the year and conducted tours for visitors.

RFID Laboratory

The RFID Laboratory is a state-of-the-art facility housing more than $500,000 worth of equipment. In February 2007, the laboratory was expanded from the old material handling laboratory and a next-

generation collaborative learning environment for both on-campus and off-campus students was developed. User-friendly, web-based applications which provide access to off-site students were built. A motorized hardware system was assembled in order to provide RFID technology testing setups in the laboratory. An agent-based architecture was used to build the hardware and software framework to make experiment setups more flexible. The software infrastructure was constructed with a view to enabling interaction among the diverse devices in this environment. The effort was supported by the National Science Foundation, Division of Undergraduate Education, Course, Curriculum, and Laboratory Improvement Program under award No: 0633334.

In addition to the hardware and software tools available, the website of the RFID laboratory offers online teaching modules for the technologies and their applications in areas such as supply chain, logistics, material handling, production planning, and automated manufacturing. The laboratory serves as an excellent resource for supporting undergraduate and graduate level course instruction, master's and doctoral level academic research, and nationally and internationally recognized research.

ADVISORY BOARD

The Arkansas Academy of Industrial Engineering (AAIE) organizes a liaison committee that serves in the capacity of an advisory board to the department. The committee is comprised of accomplished professionals from business and industry who bring both an applied perspective and an independent assessment to the industrial engineering program at the University of Arkansas.

The members of the 2009 Liaison Committee are:

- Grant DuCote, Divisional Replenishment Manager, Wal-Mart Stores, Incorporated
- Melinda Faubel, AAIE President-Elect, Director of External Affairs, AT&T Arkansas
- Ralph Sandage, AAIE President, Project Engineer, Falcon Jet
- Curtis Sawyer, Jr., AAIE Past President; Director, Supply Chain Implementation, Conagra Foods
- Gary Whicker, Senior Vice President Engineering Services, JB Hunt Transport, Inc.
- Harvey Wolfe Ph.D., Professor Emeritus, University of Pittsburgh

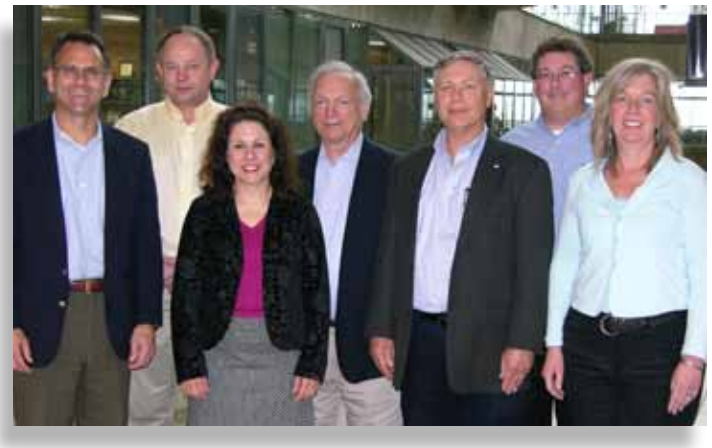


Photo courtesy of Alex Mironoff

Members of the AAIE Liaison Committee with Department Head, Dr. Kim LaScola Needy. Left to Right: Gary Whicker, Curtis Sawyer, Dr. Needy, Dr. Harvey Wolfe, Ralph Sandage, Grant DuCote and Melinda Faubel.

The AAIE was founded in 1986 to recognize the achievements of University of Arkansas Industrial Engineering graduates and to provide continuing guidance and support to the Department of Industrial Engineering. The Academy also provides its members with the opportunity to nurture the organization that played an important role in their professional growth and development. Academy members provide tremendous financial resources that endow many scholarships for the Industrial Engineering students.

CONTACT INFORMATION

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