The Center for Innovation in Healthcare Logistics was established in 2007 by Interim Department Head and Distinguished Professor Ronald R. Rardin to study the supply chain and material flow aspects of healthcare operations that can be addressed with improved information and logistics systems and processes. More detail on the structure and work of this new research initiative can be found in the "Research" section of this annual report.
Dear Colleagues:

The past year has been one of transition and change for the Department of Industrial Engineering at the University of Arkansas. Dr. John English, who served as Department Head since 2001, accepted the position of Dean of Engineering at Kansas State University in Manhattan, KS. New faculty, including myself and Dr. Sarah Root (Ph.D., University of Michigan), have been settling into our new roles in the department, and I also took on the role of Interim Department Head for one year. A successful search for a permanent head has been completed, and Dr. Kim LaScola Needy of the University of Pittsburgh, who is highly regarded throughout the IE community, will step into that position by fall, 2008.

While change poses many challenges in the short run, it also refreshes and invigorates, drawing us toward new frontiers of development and progress. Furthermore, the ongoing changes have not prevented the department from sustaining its recent progress. We continue to maintain a solid undergraduate program, now supported by a common Freshman Engineering year. Our MSIE and PhD programs are growing, as is our professional Master of Science in Operations Management—now the largest master’s program at the university.

The current report also documents some of the research initiatives that we have launched or enhanced in 2007. Particularly notable are a new Center for Innovation in Healthcare Logistics initiated in collaboration with several industrial partners, and first steps toward a Reliasoft Risk, Reliability and Maintainability Research Alliance. These initiatives come in addition to the continuing success and IE leadership of the NSF Center for Engineering Logistics and Distribution and the Mack-Blackwell Rural Transportation Center.

I’d like to recognize the faculty, staff, alumni, and students whose support and hard work in all these areas has helped us retain and enhance our standing as one of the emerging leaders among Industrial Engineering departments.

We hope that the past year has brought you much success and that we’ll be hearing from you about your department’s accomplishments. Please feel free to contact us in the medium of your choice, regarding anything in these pages that attracts your attention. We wish you all the best in your endeavors in the coming year.

Sincerely,

Ronald L. Rardin, Ph.D.
Distinguished Professor and Interim Department Head
Dr. Buyurgan holds the John L. Groff Chair in Industrial Engineering and serves as Director of Engineering Education for the College of Engineering. His primary research interests lie in separable systems modeling. He also conducts research in the area of reliability engineering, statistical quality control, modeling and analysis of flexible manufacturing systems; and automation and integration of advanced manufacturing systems. Dr. Buyurgan 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) [Virginia Tech]
- B.S.I.S.E. (Virginia Tech) [Virginia Tech]

Dr. Cassady holds the John L. Groff Chair in Industrial Engineering and serves as Head of the Industrial Engineering Department. He is the Director of the Center for Innovation in Healthcare Logistics. His research and teaching interests center on large-scale optimization modeling and algorithms, with emphasis on semiconductor manufacturing and transportation logistics. 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. (Texas Tech) [Southern Methodist University]
- M.S.I.E. (Virginia Tech) [Virginia Tech]

Dr. Fant is a Professor and the Systems Integration Chair in Industrial Engineering. His research interests include applications for machine-visioned robots in automated production/conveying and material handling systems and the development of operations research in intelligent logistics systems and warehousing. He teaches courses in robotics, machine vision and artificial intelligence for handling/warehousing systems. Dr. Fant joined the faculty in 1986.

Education:
- Ph.D. (Georgia Institute of Technology) [Georgia Institute of Technology]
- M.S.I.E. (University of Pittsburgh) [University of Pittsburgh]
- B.A. Mathematics (University of Kansas) [University of Kansas]

Dr. Fant's research interests include Auto-ID technologies; RFID system design and implementation partners. Dr. Fant's research interests include Auto-ID technologies; RFID system design and implementation at Wal-Mart, Blue Cross Blue Shield, the VHA hospital network and other industrial partners.

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

Dr. Johnson's research interests span the continuum from occupational ergonomics (e.g., head load 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 these workload, evaluating human-technology systems and investigating the effectiveness of heavy truck/automobile safety systems. Dr. Johnson conducts research in the areas of reliability engineering and human factors, and designs and development of computer-based job analysis systems for In-Vehicle Information, Communication and Entertainment Systems (IVICE) and Cognitive Ergonomics (e.g., hand tool design, reduction of musculoskeletal disorders) in commercial trucks and automobiles. His current research involves modeling these workload, evaluating human-technology systems and investigating the effectiveness of heavy truck/automobile safety systems. Dr. Johnson teaches courses in human factors engineering/ergonomics, quality control and design of experiments. Dr. Johnson joined the faculty in 1986.

Education:
- Ph.D. (S.C.A.T.) [University of Buffalo]
- M.S. (University of Illinois) [University of Illinois]
- B.A. (Psychology) [University of South Dakota]

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 algorithm, with emphasis on semiconductor manufacturing and transportation logistics. Dr. Mason teaches courses in industrial engineering, scheduling and sequencing, and the modeling and analysis of semiconductor manufacturing. 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 algorithm, with emphasis on semiconductor manufacturing and transportation logistics. Dr. Mason teaches courses in industrial engineering, scheduling and sequencing, and the modeling and analysis of semiconductor manufacturing. Dr. Mason joined the faculty in 2000.

Education:
- Ph.D. (Arizona State University) [Arizona State University]
- M.S. (University of Texas) [University of Texas]
- B.S. (The University of Texas) [The University of Texas]
Dr. Russell D. Meiller, Ph.D., PE, Professor

Dr. Meiller is Neffey Professor of Logistics and Entrepreneurship and serves as the Director of the Center for Engineering Logistics and Distribution (CEL&D) and the Deputy Director of the Center for Innovation in Healthcare Logistics (CIHL). He also serves as Director of Graduate Programs and Interim Facilitator, faculty liaison, material handling, supply chain design and operations research applications to healthcare logistics. Dr. Meiller teaches courses in facility logistics and material handling. He joined the faculty in 2005.

Education:
B.S. Natural Sciences (University of Arkansas)
M.S. Anthropology (University of Arkansas)
Ph.D. (University of Arkansas)

Dr. Chang S. Nam, Ph.D., CISP, Assistant Professor

Dr. Nam’s research interests include topics such as virtual environments, human-computer interfaces, cognitive and cultural ergonomics, and intelligent human-computer interaction. Dr. Nam teaches courses in human factors and ergonomics. He joined the faculty in 2004.

Education:
Ph.D. (Virginia Tech)
M.S.E. (SUNY at Buffalo)
M.S. M.A. (Loyola University)
B.S.I.E. (Imperial College London)

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

Dr. Pohl’s research interests include repairable systems, large-scale systems engineering and design and probabilistic design and reliability, and engineering optimization. He teaches courses in quality control, engineering statistics, simulation, risk modeling, reliability, and optimization techniques. He also teaches courses in relocation and capacity planning. He has served as the Director of the operations management program and has been selected as the next John L. Imhoff Chair in Industrial Engineering. 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. (Bowling Green State University)

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 manufacturing systems, using stochastic modeling, computer simulation, and heuristic modeling techniques. She teaches courses in operations research and service systems. Dr. Root joined the faculty in 2007.

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

Dr. Heather Nachtmann, Ph.D., Associate Professor

Dr. Nachtmann serves as the Director of the Mid-Berkley 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 2005.

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

Dr. Sandra C. Parker, Ph.D., Professor Emeritus

Dr. Parker teaches courses in operations research, project management and engineering management. She served as the Director and Chair of Studies for our operations management program until her retirement in 2007. She continues to teach in the operations management program.

Education:
Ph.D. (University of Arkansas)
M.A. Business Administration (University of Arkansas)
B.S. Natural Sciences (University of Arkansas)

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

Dr. Rossetti serves as the Chair of Undergraduate Studies. He is focused on teaching, simulation and optimization. He is a member of the National Academy of Engineers and a recipient of the Frank and Lillian Gilbreth award of the American Society of Industrial Engineers (ASIE). Dr. White teaches engineering economics.

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

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

In addition to being the Chancellor of the University of Arkansas, Dr. White is both a distinguished alumnus and faculty member of the Industrial Engineering Department. He is a member of the National Academy of Engineering and recipient of the Frank and Lillian Gilbreth award of the American Society of Industrial Engineers (ASIE). Dr. White teaches engineering economics.

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

Dr. White also holds honorary degrees from the Katholieke Universiteit of Leuven in Belgium and George Washington University.
The faculty of the Industrial Engineering Department at the University of Arkansas is engaged in a wide variety of research endeavors. This section of our annual report features a sampling of faculty research initiatives in the areas of healthcare delivery and transport and logistic. Also highlighted is the newly formed Reliasoft Risk, Reliability, and Maintainability Research Alliance, a corporate partnership designed to foster research and sustain involvement in the areas of risk analysis and reliability/maintainability engineering.

Healthcare Delivery

Healthcare in the United States is a paradox of high-taking advantages in medical research, paired with treatment that is delivered with inconsistent quality, safety, efficiency, and access, even as delivery costs continue to escalate uncontrollably. These healthcare delivery shortfalls are neither acceptable nor sustainable, and they present many exciting opportunities for contributions by industrial engineers.

While dramatic improvement is needed in nearly every aspect of healthcare delivery, the restructuring of healthcare supply chain and logistic systems represents an opportunity to recover very significant costs and achieve new efficiencies that will lead to a more transparent, cost-effective, accountable healthcare industry for America. After wages and benefits account for the greatest expense, it is conservatively estimated that some $11 billion per year is spent on human-operator-heavy processes prevalent in today’s healthcare delivery system. More automation and technology will ultimately be implemented. The human-operator-heavy feel prevalent in today’s healthcare delivery system. More automation and technology will ultimately be implemented. The human-operator-heavy feel prevalent in today’s healthcare delivery system. More automation and technology will ultimately be implemented.

Recognizing that hospitals and other large care facilities have often been slow to adopt the collaborative, IT-intensive solutions that have revolutionized other industries, CIHL approaches the task of shaping and fostering adoption of innovations in healthcare logistic by:

• Highlighting and replicating proven best practices that already benefit some patients and providers;
• Seeking opportunities to adapt logistics and supply chain solutions from other industries to the healthcare arena; and
• Conducting Center research to bridge gaps and overcome roadblocks.

The faculty of the Industrial Engineering Department at the University of Arkansas, led by the Department of Industrial Engineering, launched in 2007 a major effort to identify and foster systemic adoption of ground-breaking healthcare supply chain and logistic innovations that cost-effectively put the right materials in the hands of caregivers when and where they are needed. The Center’s goal is to recover significant costs and achieve new efficiencies, while enhancing safety, quality and equity of patient care. The new Center for Innovation in Healthcare Logistics, or CIHL (pronounced ‘kyle’), will lead a nationwide approach to addressing some of the critical challenges in healthcare supply chain and logistic systems.

Center for Innovation in Healthcare Logistics

Drawing on its rich expertise in supply chain and logistic engineering, the University of Arkansas, led by the Department of Industrial Engineering, launched in 2007 a major effort to identify and foster systemic adoption of ground-breaking healthcare supply chain and logistic innovations that cost-effectively put the right materials in the hands of caregivers when and where they are needed. The Center’s goal is to recover significant costs and achieve new efficiencies, while enhancing safety, quality and equity of patient care. The new Center for Innovation in Healthcare Logistics, or CIHL (pronounced ‘kyle’), will lead a nationwide approach to recovering very significant costs and achieving new efficiencies that will lead to a more transparent, cost-effective, accountable healthcare industry for America. After wages and benefits account for the greatest expense, it is conservatively estimated that some $11 billion per year is spent on human-operator-heavy processes prevalent in today’s healthcare delivery system. More automation and technology will ultimately be implemented.

The Center has grown to have sustaining support from approximately 5 years at over $600K annually, and a new headquarters office has been provided by the College of Business and CIHL employs a team of outstanding faculty and graduate students from the College of Engineering and the Walton College of Business, including approximately 10 faculty members, 7 graduate students, and a Program Assistant. Ronald L. Rardin, John and Mary Lib White Distinguished Professor of Industrial Engineering, is Director of the Center, and Russell D. Meller, Hefley Professor of industrial Engineering, is Deputy Director.

CIHL Approach and Initial Projects

CIHL approaches the task of shaping and fostering adoption of innovations in healthcare logistic by:

• Highlighting and replicating proven best practices that already benefit some patients and providers;
• Seeking opportunities to adapt logistics and supply chain solutions from other industries to the healthcare arena; and
• Conducting Center research to bridge gaps and overcome roadblocks to progress.

Prior work on healthcare logistics innovations has too often produced “one-of,” single-site successes that go unadopted and in many instances, untested even at the original site. To avoid this trap, CIHL projects seek broader solutions that can be replicated and scaled, making them adaptable to multiple settings. Training and decision-making aids are also planned to help make the business and healthcare cases for preferred solutions and to facilitate their systemic adoption.

Following this vision of industry-wide impact, the fall 2007 partners’ meeting agreed to initiate CIHL efforts with 3 projects:

• Unit and Dose Packaging System Analysis (PI Dr. Russ Meller, CoPI's Drs. Scott Mason and Sarah Root) focuses on improving efficiency and reducing errors in packaging pharmaceuticals as they pass from bulk quantities, produced by manufacturers to the unit or course of treatment doses, needed by patients. Opportunities include exploiting economies of scale through centralized and third-party processing.

The small-scale evaluation regarding device to be used in single hospital to create and doses from bulk packaged medicines for distribution to patients. It illustrates the “cottage industry,” where too often “one-of,” single-site successes that go unadopted and in many instances, untested even at the original site. To avoid this trap, CIHL projects seek broader solutions that can be replicated and scaled, making them adaptable to multiple settings. Training and decision-making aids are also planned to help make the business and healthcare cases for preferred solutions and to facilitate their systemic adoption.

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The small-scale evaluation regarding device to be used in single hospital to create...
Transportation and Logistics

The University of Arkansas has a longstanding tradition of conducting advanced research and educational programs in the area of transportation & logistics. Through participation in the Center for Engineering 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 the management of a multi-million dollar research project from the Mack-Blackwell Rural Transportation Center (MBTC).

Center for Engineering Logistics and Distribution

CELDi is a multi-university, multi-disciplinary National Science Foundation sponsored Industry/University Cooperative Research Center (I/UCRC), headed by Russell D. Meller of our faculty. The center was created to provide integrated solutions to logistics problems through research related to modeling, analysis and intelligent-systems technologies. In the last year, the center added Virginia Tech and the University of Missouri to its list of academic partners. These universities join existing CELDi members: the University of Arkansas, the University of Louisville, Oklahoma State University, the University of Oklahoma, Lehigh University, Texas Tech University and Clemson University.

Faculty members of the Department of Industrial Engineering at the University of Arkansas bring their expertise to the partnership in the areas of material handling systems, logistics network optimization, simulation of logistics systems, analysis of spare-parts logistics systems and logistics systems performance measurement. The more than 30 member organizations of CELDi drive the research endeavors of the center. During 2007, our faculty obtained over $750,000 in research funding from CELDi and its member organizations. More information can be found on the center’s web site www.celdi.ing.unr.edu.

Mack-Blackwell Rural Transportation Center

In 2007, Dr. Heather Nachmann of our faculty was appointed director of the Mack-Blackwell Rural Transportation Center (MBTC). MBTC is a U.S. Department of Transportation funded interdisciplinary research center, headquartered in the Department of Civil Engineering at the University of Arkansas. By contributing to better road, waterway, rail and airway systems for freight distribution in rural areas, MBTC helps to move people and goods to their destinations more efficiently and economically. MBTC has become a national center for excellence in transportation infrastructure design and maintenance, in traffic logistics planning and management, in transportation policy and in the effects of transportation on social and economic conditions. The center was recently selected as a National Transportation Security Center of Excellence. Institutions that make up the NTSCOE are funded by the federal government to conduct research that will improve the security of America’s transportation systems. MBTC sponsors interdisciplinary research in all modes of transportation at the University of Arkansas and other institutions. All research funding is matched dollar-for-dollar by federal, state or industry sources. MBTC-sponsored projects are required to involve graduate and/or undergraduate students, thus giving many students from our department the opportunity to gain research experience. More information may be found at the center’s web site www.mackblackwell.org.

The department’s 2007 in-force research awards, together with industry and state matching funds, exceeded $600,000. The research described below is one MBTC project undertaken by our faculty and graduate students last year.

A Nationwide High-Speed Rail Network for Freight Distribution

Russell D. Meller, Ph.D. and Jen Pazour, a graduate student in Industrial Engineering at the University of Arkansas, think they know a way to address the problem of rapidly growing congestion on America’s highways. Highway congestion today results in an estimated cost of $7.8 billion in lost productivity annually and is expected to grow. To alleviate congestion issues, it has often been recommended that the United States should build more high-speed passenger rail capacity. However, since passenger traffic shares highways with freight traffic, the researchers examined an alternate approach to alleviating congestion; namely, removing freight traffic from our highways through the development of a national high-speed network for freight distribution. Meller and Pazour were assisted in their work by Lei Shi, another graduate student in the Department, and Kevin
Model of a 20,000-mile nationwide high-speed rail network, developed by researchers Meller et al. in their research on freight rail congestion. The model created by the researchers showed that with sufficient capacity and associated investment, a high-speed network for freight distribution, such a network would be commercially attractive, especially for “truckload” distribution, even on a network that is significantly smaller than the current interstate highway system. The specific objective of Meller et al.’s research was to explore the maximum impact of instituting a high-speed rail network for freight distribution. This research utilized the results of technology-feasibility tests and addressed the problem of designing such a network, as well as analyzing its maximum impact on the current highway system. The model created by the researchers showed that with sufficient capacity and associated investment, a high-speed network for freight distribution will have a significant impact on freight transit times and on highway congestion, with the potential to address many of the challenges facing transportation today. For example, a 20,000-mile network (approximately half the length of the present U.S. interstate highway system) that utilizes current Maglev technology and proposed 6-minute headways would make it advantageous for a majority of the freight traffic to utilize the high-speed network. And although such a network would require a significant investment of $70B-$28T (using current cost estimates of $38M-$140B per mile), this investment would lead to an estimated 38% reduction in overall freight transit times. Perhaps more importantly to the public, it would not precipitate a net 78% decrease in annual total truck highway miles driven. ReliaSoft Risk, Reliability and Maintainability Alliance ReliaSoft Corporation donated over $700,000 in cash and software to the University of Arkansas in 2007 to form and support the ReliaSoft Risk, Reliability, and Maintainability Research Alliance (R³MRA). The purpose of this research alliance is to provide integrated solutions to complex risk, reliability, and maintainability problems for commercial, military and government applications through modeling, simulation, and analysis. Drs. Edward A. Pohl (Director), C. Richard Cassady (Associate Director) and Justin Chirina, all of the U of A Department of Industrial Engineering, are the current academic associates of the ReliaSoft Research Alliance. The alliance is designed to facilitate interaction between industry and academia and to serve as a conduit for sharing research problems and solutions among members. Industry members of the alliance bring relevant problems and some level of financial resources to the alliance, while the academic members of the alliance facilitate the partnership and leveraging of resources among university researchers. The objective is to bring systematic research efforts to bear on problems of interest to all alliance members. The vision for this research alliance is to develop an internationally recognized center of excellence in the area of Reliability, Maintainability and the Model on the Industry/University Cooperative Research Centers (I/UCRC) that are sponsored by the National Science Foundation. The rationale for a research alliance that is focused on questions of risk, reliability and maintainability can be summarized as follows: • Reliability and maintainability are critical elements for all engineering systems. Because of rapid advances in technology the level of complexity of engineering systems has been growing exponentially, and this trend is increasing, the tools and techniques necessary to ensure reliability and maintainability must continue to increase. • Since the events of September 11, 2001, risk analysis has acquired new importance in the field of engineering systems design. As a result, the design paradigm of all systems must be expanded to include considerations of risk and vulnerability. • The technical workforce is graying and the “baby boom” generation is fast approaching retirement age. In addition to a growing shortage of engineers in general, risk, reliability and maintainability engineers will soon be in particularly short supply, given that most new entrants to the profession came to it during the establishment of the space program in the 60’s and the military buildup of the 70’s and 80’s. Therefore, another goal of this alliance is to define and provide educational solutions in risk, reliability and maintainability as a service to industry. The initial donation of software by ReliaSoft is intended to provide engineering students with state-of-the-art tools to help identify potential risks and calculate the severity of disruptions within a manufacturing or transportation environment. The cash portion of the donation will be used to purchase computing equipment to create the collaborative research and learning center in the areas of risk, reliability and maintainability described above. In addition, the grant will be used to “seed” graduate and undergraduate research in the alliance’s focus areas. ReliaSoft Corporation Chief Executive Officer, Pantelis Vassiliou (center) and Vice President, Doug Rights (far right), present a larger than life check, representing their company’s significant funding of the new Risk, Reliability and Maintainability Research Alliance. Accepting the donation for the U of A are (left to right), Dr. Russell D. Meller, COE Dean Ashok Saxena and R³MRA Director Dr. Ed Pohl.
Refereed Journal Articles


Refereed Conference Proceedings and other Refereed Publications


During 2007, the following research grants were in force for the faculty. Project PIs are indicated in bold face type.


**Buyurgan, Nebil, State of Arkansas Undergraduate Research Fellowship Program, $2,650, "Robustness of Statistical Process Control," 2007**

**Buyurgan, Nebil, and Justin Chimka, National Science Foundation, $149,709, "Integrated Auto-ID Technology for Multidisciplinary Undergraduate Studies (IATUS)," 2007-2009**

**Cassady, Richard and Edward Pohl, National Science Foundation/CESDI, $30,000, "Research Experiences for Teachers," 2005-2008**


**Fant, Ernest, Red River Army Depot/CESDI, $50,000, "Economic and Technical Viabilities of Implementing Robotics in an Automotive Repair Environment," 2002-2008**

**Fant, Ernest, Red River Army Depot/CESDI, $49,889, "Assessing Change Indicators in Activity, Equipment and Inventory for Automated Storage Facility," 2002-2008**

Johnston, Steven, American Transportation Research Institute, $49,000, "Investigation of Safety and Economic Impact of Speed Differentials Between Heavy Trucks and Automobiles," 2006-2008

**Johnson, Steven, Mack-Blackwell Transportation Center, "Field Evaluation of Lane Departure Systems: Operational Effectiveness, Effect on Driver Behaviors and Managerial Use of Data to Assure Driver Acceptance," $15,360, 2005-2008**

**Johnson, Steven and Chang Nam, Mack-Blackwell Transportation Center, $41,471, "Development of a Human Performance Simulation Model to Evaluate In-vehicle Information and Control Systems," 2004-2007**

**Mason, Scott, Sam's Club/CESDI, $45,000, "Improving Retail Logistics through an Examination of Merchandise Flow," 2007-2008**

**Mason, Scott, National Science Foundation/CESDI, $25,000, "Collaborative Research: A TIE Research Program on a Design for Design of Supply Chain System," 2007-2009**


**Mason, Scott and Heather Nachtmann, Air Force Office of Scientific Research, $250,000, "Integrated Distribution Planning and Forecasting for Medical Logistics," 2006-2008**

**Meller, Russell, Mack-Blackwell Transportation Center, $81,678, "A Nationwide High-Speed Rail Network for Freight Distribution," 2006-2008**

**Meller, Russell, National Science Foundation, $647,016, "CESDI Center Administration," 2002-2009**

**Meller, Russell, National Science Foundation, $238,797, "Designing Distribution Centers for a Service Economy," 2006-2009**

**Meller, Russell, National Science Foundation, $211,973, "A Sequence-parallel and MIP-Based Facility Layout Algorithm," 2006-2009**


**Nam, Chang, Air Force Office of Scientific Research, $120,924, "Experimental Evidence on Team Coordination and Collaboration within a Distributed Medical Logistics Network," 2006-2008**

**Nam, Chang, and Tony Smith-Jackson, National Science Foundation, $670,038, "FESL: Innovative Flexible Experimental Environment for Learning in SCIENCE," 2007 - 2010**

**Nam, Chang and Joon J. Song, Mack-Blackwell Transportation Center/Arkansas State Highway & Transportation Department, $160,004, "A Model-Based Risk Map for Roadway Traffic Crashes," 2006-2007**


**Pohl, Edward, National Science Foundation/CESDI, $35,925, "Information Product Quality in a Network Center Environment," 2004-2008**


**Pohl, Edward and Richard Cassidy, National Science Foundation/CESDI, $20,000, "Research Experiences for Teachers," 2005-2006**


**Rardin, Ronald, Russell Meller, Scott Mason, Sarah Root, Nebil Buyurgan, Manuel Rossetti, Heather Nachtmann, and Edward Pohl, Corporate Sponsor of the Center for Innovation in Healthcare Logistics, $2,250,000, (all projects), 2007-2012**
Dr. Russell D. Meller took the award for best paper in the Facility Logistics Track at the 2007 Industrial Engineering Research Conference. The award for the paper, entitled “An Evaluation of Two New Warehouse Aisle Designs for Dual-Command Travel,” was presented at the May 2007, Institute of Industrial Engineers Awards Banquet in Nashville, TN. Co-authors were Letitia M. Pohl and Dr. Kevin Gue.

Dr. C.S. Nam’s paper, “Effects of Cultural Difference and Task Complexity on Team Interaction Process,” was awarded the distinction of best paper at the annual meeting of the Ergonomics Society of Korea.

Rossetti, Manuel, National Science Foundation, $50,000, “CELDi/CHMR TIE Project: Examining Inventory Allocation in the Health Care Value Chain,” 2004-2008
Rossetti, Manuel, National Science Foundation through CELDi, $50,000, “Radio Frequency Identification and Productivity Improvements in Military Supply Chains,” 2004-2008
Rossetti, Manuel and Nabil Buyurgan, Wal-Mart, Inc./CELDi, $50,000, “Improving Inventory Record Accuracy within Retail Store Operations,” 2005-2007
Rossetti, Manuel and Edward Pohl, National Science Foundations, $40,000, “An Intermittent Demand Forecasting Tool,” 2007
Meller, R.D.  
• Director, Center for Engineering Logistics and Distribution (an NSF/UCRC)  
• Immediate Past President, College-Industry Council on Material Handling Education  
• Chair, Facility Logistics Special Interest Group, Transportation Science and Logistics Society, INFORMS  
• Editorial Board Member, Journal of Manufacturing Systems  
• Member, 2008 IMHRC Planning Committee  
• Member, 2007 IERC Program Committee (Facility Logistics Track)

Nachtmann, H.  
• Area Editor, The Engineering Economist  
• Immediate Past Director, Institute of Industrial Engineering - Engineering Economy Division  
• Member, Wellington Award Selection Committee, Institute of Industrial Engineering - Engineering Economy Division  
• Member of the Planning Committee, Transportation Research Board ñ UTC Spotlight Conference  
• Member of Advisory Board, Identity Solutions Symposium

Nam, C. S.  
• Member, Program Board, International Conference on Human-Computer Interaction  
• Member, International Program Committee, The IASTED International Conference on Human-Computer Interaction (IASTED-HCI)  
• Member, International Program Committee, The IASTED International Conference on Education and Technology (IASTED-ICET)  
• Newsletter Editor, Cognitive Ergonomics and Decision Making (CEDM) Technical Group, Human Factors and Ergonomics Society  
• Newsletter Editor, Virtual Environments (VE) Technical Group, Human Factors and Ergonomics Society

Pohl, E.A.  
• Associate Editor, Journal of Military Operations Research  
• Associate Editor, IEEE Transactions on Reliability  
• Associate Editor, Journal of Risk and Reliability  
• President, Military Applications Society of INFORMS  
• Member, Management Committee, Program Committee, Annual Reliability and Maintainability Symposium  
• NSF Panelist, EFl Program, 2007

Rardin, R.L.  
• Associate Editor, Operations Research  
• Guest Associate Editor, IIE Transactions: Special Issue on Healthcare Engineering  
• Fellow, Institute of Industrial Engineers

Rossetti, M.D.  
• Co-Editor, 2009 Winter Simulation Conference Proceedings  
• Associate Editor, International Journal of Modeling and Simulation  
• NSF Panelist, SBIR Program, Information Technology Applications, 2006 – present  
• Panelist, Research Grants Council, Hong Kong

In the fall of 2007, 120 students were enrolled in our undergraduate program. While this number would appear to be lower than those of recent years, it is actually an artifact of the newly-constituted Freshman Engineering Program, headed by Dr. Richard Cassady of our department. The program provides a common academic foundation in engineering to all incoming freshmen before allowing them to major in a specific engineering discipline. Our undergraduate program, as most others in the College of Engineering, was therefore unable to claim an incoming freshman class. In its first year of operation the Freshman Engineering Program boasted 343 students. An update on the program is included in this section.

2007 Highlights

During the 2006-2007 academic year 44 BSIE degrees were granted. Members of the class of 2007 were hired by nationally recognized companies such as J.B. Hunt Transport, Lockheed-Martin, Raytheon, Wal-Mart, and Welch’s. A number of students chose to remain at the University of Arkansas for graduate studies in Industrial Engineering and Business Administration. Other graduates are furthering their education at institutions, such as Georgia Tech, Cornell, and UA Medical School in Little Rock.

Awards and honors earned by undergraduates include the following:

Senior Josh Liu (advisor: Dr. Heather Nachtmann) was awarded a SURF grant for his honors thesis topic, “The Contributions of the Nobel Laureates in Economics.” Two other advisees of Dr. Nachtmann, senior Siddi Burin and senior Adam Kesey were also recipients of Honors College research grants.
The College of Engineering's Alpha Pi Mu chapter received second place at the 2007-2008 Material Handling Student Design Competition. Seniors Laura Jordan and Roger Snelgrove received scholarships from Martin, Pratt & Whitney, Trane, International Paper, Lockheed Martin, and other major employers. Senior Jared Townsley (advisor: Dr. Edward Pohl) received a SURF Grant in 2007 to support his research on Terrorism Networks. A team comprised of Seniors Frederick Denny, Meredith Griffin, Alex Carter and Sean O'Meara. Sophomore Coby Durham (advisor: Dr. Richard Cassady) presented his research at the First International Conference on Mathematical Modeling in Education and Modern Materials Handling magazine. Crystal Wilson garnered the ABF Freight Systems Outstanding Freshman Award.

The Freshman Engineering Program completed its first year of operation in 2007 with Industrial Engineering Associate Professor C. Richard Cassady at its helm. The program was developed as a means of helping 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. Participating students work in teams to identify and solve real-life industrial engineering problems for their respective client organizations.

Most industrial engineering students that are also enrolled in the University of Arkansas Honors College. 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.

As a part of their introductory coursework, this year's freshmen were challenged to find effective solutions to one of several design problems posed by the faculty. Projects with intriguing names such as "A Mousetrap-Powered Vehicle" and "Slow Dropping Aircraft" were then assigned to teams comprised of 3 to 4 students each. Strict constraints were imposed on resources that could be used for constructing each project. Up to ten learning experiences at Ayrshire, Boeing, Hallmark, International Paper, Lockheed Martin, Pratt & Whitney, Trane, Union Pacific, Wal-Mart, and other major employers.

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 over-

In the classroom and to interact with experienced industrial engineers.

The program was designed as a means of helping new students who were just entering the College of Engineering to obtain a firm understanding of industrial engineering concepts and to lay a shared foundation for their future development in the engineering discipline of their choice. Students in the Freshman Engineering Program take a common set of courses for one year. Upon successfully completing this program, they then move on to a discipline-specific undergraduate program within the College of Engineering.

The College of Engineering’s Alpha Pi Mu chapter received the Gold Award in the 2007 IIE national chapter recognition competition. The Gold Award 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).

Senior Jared Townsley (advisor: Dr. Edward Pohl) received a SURF Grant in 2007 for his honors thesis on "Multicultural Organizational Simulation of a Terrorism Network."

The Senior Engineering Program is a firm grounding in general engineering concepts and to lay a shared foundation for their future development in the engineering discipline of their choice. Students in the Freshman Engineering Program take a common set of courses for one year. Upon successfully completing this program, they then move on to a discipline-specific undergraduate program within the College of Engineering.

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Major accomplishments of the Freshman Engineering Program's inaugural year included:

- The development of an initial budget for the program
- The renovation of 5500 sf of Engineering Hall into the new reading space, an Enhanced Learning Center classroom, a fifty-seat computer lab, and a study lounge
- The planning and execution of Orientation for Freshman Engineering students
- The formation and operation of the Freshman Engineering instructional team which includes the Freshman Engineering Instructor, five College of Engineering assistants, and seven graduate teaching assistants
- The development and offering of GNEG 1111 for Freshman Engineering students

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GRADUATE STUDIES

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.

2007 Highlights

Our graduate program was ranked 27th in the US News and World Report rankings of graduate manufacturing and industrial engineering programs, having moved up two places.

Approximately 56% of our on-campus graduate students received some sort of financial assistance from the department through graduate research assistantships.

Our graduate students gained recognition, awards and honors in 2007 and published or presented their research in several major venues.


Doctoral student Letitia Pohl (advisor: Dr. Russell D. Meller) was also co-author on the latter paper and presented her research at both the 2007 Industrial Engineering conference in Nashville, TN and at the INFORMS annual meeting in Seattle, WA. In addition, Ms. Pohl was awarded the Modern Materials Handling Magazine Honor Scholarship ($2,500) from the Material Handling Education Foundation.

Ph.D. student Alp Ertem (advisor: Dr. Nabil Buyurgan) co-authored “Read Rate Analysis of RFID Systems for Business Applications,” which appeared in the International Journal of RFID Technology and Applications. He presented his research at both the 2007 Industrial Engineering conference in Nashville, TN and at the INFORMS annual meeting in Seattle, WA.

Doctoral students Jennifer Ferguson (advisor: Dr. Scott Mason) and Zeynep Kirtizoglu (advisor: Dr. Russell D. Meller) also presented their research at the same INFORMS meeting.

Yihsia Yang, a Ph.D. student working with advisor Dr. Richard Cassidy, was co-author of two papers: “Time to Failure Behavior under a Stochastic Deterioration Model,” presented at the Annual Reliability and Maintainability Symposium in Orlando, FL, and “Comparing Scheduled and Condition-Based Maintenance Policies for Single-Unit Systems Operated in Markovian Environments,” presented at the 2007 IE Annual Conference in Nashville, TN.

Doctoral student Kellie Schneider (advisor: Dr. Richard Cassidy) co-authored “The Use of Single-Use Medical Devices,” a paper she presented at the 2007 Industrial Engineering Research Conference in Nashville, TN.

Our graduate program 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 three areas:

• Master of Science in Industrial Engineering (M.S.I.E.)

• Master of Science in Operations Research (M.S.O.R.)

• 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 programs:

• 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:

Economic Analysis

Engineering Logistics and Distribution

Ergonomics/Human Factors

Facilities Design

Healthcare Logistics

Homeland Security

Human-Computer Interaction

Logistics and Distribution System Design

Manufacturing Systems

Operations Research

Production Control and Materials Management

Quality Assurance

Reliability Engineering

Safety Engineering

Simulation Modeling & Analysis

Work Measurement
Responsibilities more efficiently and effectively. The curriculum is presented both work processes and people in a wide spectrum of organizations. The curriculum grows out of an Industrial Engineering perspective that is typical of most traditional graduate programs. Students are able to select from over 20 courses to make up the ten courses required to complete the degree. Several specific paths through the course material are offered providing concentrations in Industrial Management, Business Management, Human Resources Management, or Health & Safety Management.

The need for trained operating managers is clear. Students who meet the admission standards can enter the program in the first 12 hours of study. Students who come to us from three primary sources: the business world, the armed services, and undergraduate academic programs. The Corporate Affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and AT&T. Corporate affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and AT&T.

Operations Management Master’s Program

The Operations Management program is designed for the working student who typically holds a professional or management position in an organizational setting, whether business, military, non-profit, or governmental. Program content focuses squarely on the concepts, methods, and tools that are essential to the successful management of corporate affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and AT&T. Corporate affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and AT&T. Corporate affiliations of our current students include numerous Fortune 500 companies such as Wal-Mart, Tyson Foods, J.B. Hunt Transport, FedEx, Lockheed-Martin, and AT&T.

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The Larry and Gwen Stephens Undergraduate Research Laboratory is a research facility made possible by a generous donation by Mr. and Mrs. Stephens in 2006 and 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 12 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.

The lab provides students with a variety of hands-on experiences in conjunction with several manufacturing related courses offered by the department.

Material Handling Laboratory

The Material Handling Laboratory is a state-of-the-art facility housing more than $500,000 worth of material handling and storage equipment. The laboratory serves as an excellent resource for supporting undergraduate and graduate level instruction, masters and doctoral thesis research, as well as externally funded research. The laboratory houses a full-scale Hytrol conveyor system that consists of linear and circular components, integrated with barcode technology. A horizontal storage carousel serves as an automated storage and retrieval system (AS/RS) for the conveyor system. Material handling and storage machinery is controlled using cutting edge programmable logic controllers (PLC) that allow students to simulate and develop digital and analog control models. The lab provides students with a variety of hands-on experiences in conjunction with several manufacturing related courses offered by the department.

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 robotic arm/machine vision system), an IBM SCARA robotic arm/machine vision work cell with conveyor, and a new Southworth lift table. This equipment was purchased with funds resulting from external grants and research purposes. Recently, Dr. Earnest Fant combined the two-axis linear module with the six-axis arm in such a way that the arm could be carried in an inverted position to any location within a radius 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 (ATMS) (a four-camera machine vision system), an IBM SCARA for system control has been modified so that other research and instructional projects can be performed by students.

RFID Laboratory

In February 2007, the RFID laboratory was expanded 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-campus students were built by a research team led by Dr. Nebil Buyurgan and Justin Chimka. 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 has been constructed with a view to enabling interaction among the diverse devices in this environment.

In addition to the hardware and software tools available, the website of the RFID lab offers online teaching modules for AutoID technologies and their applications in areas such as supply chain, logistics, material handling, production planning, and automated manufacturing. The expanded laboratory serves as an excellent resource for supporting undergraduate and graduate level instruction, M.S. and Ph.D. level research; as well as externally funded research.

The first Industrial Engineering RFID laboratory at the University of Arkansas was established by Dr. Nebil Buyurgan in January 2005, within the Materials Handling Laboratory. Several types of state of the art antennas, high-performance multi-protocol readers, software and an RFID tag printer were installed for students to use with previously available material handling and storage equipment. Since its inception the laboratory has provided students with a variety of hands-on experiences in conjunction with several courses, offered by the industrial engineering department.
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 2007 Liaison Committee are:

• Jessica Hall, Sales Representative, Daiichi Sankyo Co., Ltd.
• Ken Musselman, Ph.D., President IIE
• Brett Peters, Ph.D., Professor and Head, Industrial and Systems Engineering, Texas A & M University
• Andrea Sandage, Past President, AAIE Board; Supply Chain Specialist, Hawker Beechcraft Corporation
• Curtis Sweyer, Jr., AAIE President; Director, Supply Chain Implementation, Conagra Foods
• Gary Whicker, Senior Vice President Engineering Services, JB Hunt Transport, Inc.

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. These members provide tremendous financial resources that endow many scholarships for the student body within the department.