2006 SUMMARY OF ENGINEERING RESEARCH

A Report of Activities during 2005

This report is part of the larger *2006 Summary of Engineering Research*, available on the Web at www.engr.uiuc.edu/research and on CD-ROM. The *Summary of Engineering Research* represents the extensive engineering research program conducted in 2005 at the University of Illinois at Urbana-Champaign. Detailed statistics about research in the College of Engineering are included in the *Directory of Engineering and Engineering Technology Programs and Research*, published by the American Society for Engineering Education, Washington, D.C.

How to use the *Summary of Engineering Research*: Research projects are listed by title, followed by the names of the investigators and the sponsoring agencies. Projects are sorted by major topic areas. Project descriptions are brief. Additional information on each project may be obtained from the investigator in charge (denoted by an asterisk). Mailing addresses are provided on the introductory page.

How to obtain publications: Please consult academic and public libraries for the journal articles, papers, and books listed in this report. Information about technical reports is available from the Engineering Documents Center, Grainger Engineering Library Information Center, 1301 West Springfield Avenue, Urbana, IL 61801, USA. To search the center's collection on the Internet, please visit the website at search.grainger.uiuc.edu/top. Copies of theses can be found at the University of Illinois Library, www.library.uiuc.edu, or may be purchased from University Microfilms, 300 Zeeb Road, Ann Arbor, MI 48106, USA, www.umi.com.

The *2006 Summary of Engineering Research* is produced by the Office of Engineering Communications, University of Illinois at Urbana-Champaign.

Tina M. Prow: Editor and Coordinator
Peggy Currid: Freelance Editor, Publications Sections
Jim Vattano: Graphic Designer
Thomas G. Habing: Research Programmer, Grainger Engineering Library Information Center
William H. Mischo: Engineering Librarian, Grainger Engineering Library Information Center

Please send queries and comments about the *2006 Summary of Engineering Research* to the Engineering Communications Office, 303 Engineering Hall, MC-266, 1308 West Green Street, Urbana, IL 61801, USA, or email research@engr.uiuc.edu.

Abbreviation key for College of Engineering departments and major labs:

- Advanced Transportation Research and Engineering Laboratory (ATREL)
- Aerospace Engineering (Aerosp. Engr.)
- Agricultural and Biological Engineering (Ag. & Biol. Engr.)
- Bioengineering (Bioengr.)
- Chemical and Biomolecular Engineering (Chem. & Biomol. Engr.)
- Civil and Environmental Engineering (Civil & Environ. Engr.)
- Computer Science (Comput. Sci.)
- Coordinated Science Laboratory (CSL)
- Electrical and Computer Engineering (Elect. & Comput. Engr.)
- Frederick Seitz Materials Research Laboratory (FS-MRL)
- General Engineering (Gen. Engr.) or Industrial & Enterprise Systems Engineering (Indus. & Enter. Syst. Engr.)*
- Materials Science and Engineering (Mat. Sci. & Engr.)
- Mechanical and Industrial Engineering (Mech. & Indus. Engr.) or Mechanical Science and Engineering (Mech. Sci. & Engr.)*
- Micro and Nanotechnology Laboratory (MNTL)
- Nuclear, Plasma, and Radiological Engineering (Nucl., Plasma, & Radiol. Engr.)
- Physics
- Theoretical and Applied Mechanics (Theoret. & Appl. Mech.)*

*In August 2006, the Industrial Engineering program was merged with the General Engineering Department, which became the Industrial and Enterprise Systems Engineering Department. The Theoretical and Applied Mechanics Department merged with the Mechanical and Industrial Engineering Department, which became the Mechanical Science and Engineering Department. Please check department links at www.engr.uiuc.edu for current faculty lists.

ILLINOIS
1867
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
TM

Research Organizations, Centers, and Laboratories

Advanced Transportation Research and Engineering Laboratory
Imad L. Al-Qadi, Director
alqadi@uiuc.edu
University of Illinois
1611 Titan Drive
Rantoul, IL 61866
217-893-0705
http://www.ict.uiuc.edu/atrel

The Advanced Transportation Research and Engineering Laboratory (ATREL), one of the top transportation research facilities in the nation, is a comprehensive transportation research, educational, and testing laboratory. The ATREL facility is located on 47 acres in Rantoul, Illinois, with 60,000 square feet of building space.

Three main buildings support laboratory and full-scale testing research, office space, technical library, and continuing education classrooms. The largest building is reserved for laboratory characterization of advanced materials for pavements and railroads and nondestructive testing equipment. A second building supports research on transportation operations, safety, system simulations, and intelligent transportation systems. A third structure houses unique equipment for large-scale testing and materials processing. ATREL also has 3.5 acres of land available to construct full-scale highway and airfield pavement structures and rapidly test them utilizing the on-of-a-kind Accelerated Transportation Loading ASsembly (ATLAS).

ATREL is home to the Illinois Center for Transportation (ICT), a collaborative program funded by the Illinois Department of Transportation (www.ict.uiuc.edu). ICT focuses on research, education, and outreach to solve transportation problems occurring in the state of Illinois and the nation in order to improve transportation safety, promote efficiency, and reduce congestion. Additional ATREL research is sponsored by industry, state, and federal agencies such as the Federal Highway Administration, Federal Aviation Administration, O'Hare Modernization Program, American Association of Railroads, and National Cooperative Highway Research Program.

Anderson Laboratory for Global Education in Engineering
Bruce Vojak, Director
bvojak@uiuc.edu
306 Engineering Hall
1308 West Green Street
MC-266
Urbana, IL 61801
217-333-6057
http://www.engr.uiuc.edu/OCEE/anderlab

The Anderson Laboratory for Global Education in Engineering (Anderson Lab) supports the College of Engineering in the development of online graduate programs as well as effective, cost-efficient online teaching materials directed at K-12 audiences. The Anderson Lab developed a set of Atomic Force Microscope instruction modules for the Nano-CEMMS Center. A paper on "Magic Sand and the Hydrophobic Effect" is being converted into educational activities for middle school students. These educational activities will be used in WaterCAMPWS summer camps. The Anderson Lab is currently working with the Physics Department and the College of Education on activities related to the 50th anniversary of the BCS Theory of Superconductivity, developed at the University of Illinois. Interactive online materials for use by middle and high school students are being created. Additionally, the Anderson Lab will create a website on which to host these materials and work with middle and high school teachers in central Illinois to test the materials in summer camps before implementation in their classrooms.

Beckman Institute for Advanced Science and Technology
Pierre Wiltzius, Director
publications@beckman.uiuc.edu
University of Illinois
405 North Mathews Avenue
MC-251
Urbana, IL 61801
217-244-1176
http://www.beckman.uiuc.edu

The Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign is the largest and most ambitious university-based multidisciplinary research facility in the United States. It was founded on the premise that reducing the barriers between traditional scientific and technological disciplines can yield greater research advances than more conventional approaches.

The building was made possible by a $40 million gift - at the time the largest ever presented to a public university - from University of Illinois alumnus Arnold O. Beckman, founder of Beckman Instruments, Inc., and his wife, Mabel M. Beckman. A $10 million grant from the State of Illinois, which also provides ongoing operating support for the facility, supplemented this gift. The research programs in the building are supported mainly by external funding from the federal government and from corporations and foundations.

Research performed at the Beckman Institute focuses on three broadly defined main research initiatives: Biological Intelligence, Human-Computer Intelligent Interaction, and Molecular and Electronic Nanostructures.

The general goal of the Biological Intelligence research initiative is to develop understanding of intelligent systems by studying the diverse ways in which neurally-based systems become capable of intelligent behavior and to use this knowledge, for example, to implement such processes in the design of intelligent devices. Within this research theme, programs extend from biochemical, molecular, and cellular-level studies of how neurons work, through integrative and computational neuroscience, to cognitive science, which seeks to understand how humans process sensory information and represent knowledge.

The general goal of the Human-Computer Intelligent Interaction research initiative is to improve the ways a human operator interacts with a computer by studying not only the input-output techniques but also the human factors. Within this research theme, programs range from artificial intelligence, robotics, computer vision, cognitive science, and human perception and performance to virtual reality environment experiments carried out in collaboration with the National Center for Supercomputing Applications.

The general goal of the Molecular and Electronic Nanostructures research initiative is to develop a fundamental understanding of chemical and physical processes in molecular nanostructures, mesoscopic semiconductor-based systems, and macromolecular assemblies, with emphasis on future electronic or optoelectronic applications. Within this research theme, programs range from computational electronics and scanning tunneling microscopy, including lithography and fabrication of semiconductor nanostructures, and photonics, to efforts to synthesize and characterize new materials, including self-organized syntheses of inorganic, organic, and biochemical systems.

Twelve Beckman Institute research groups, composed of faculty and students from more than 30 University of Illinois departments as far ranging as psychology, computer science, and biochemistry, are investigating these and other areas. The building, with its more than 200 offices, specialized, state-of-the-art laboratories and facilities, and meeting areas for conferences, workshops, and casual interactions, provides an ideal environment for fostering collaborative research.

Boeing Trusted Software Center
Bruce Vojak and William H. Sanders, Directors
whs@iti.uiuc.edu
Coordinated Science Laboratory
1308 West Main Street
Urbana, IL 61801-2307
217-244-8920
http://www.iti.uiuc.edu/centers/Boeing.html

The Boeing trusted software center at the University of Illinois at Urbana-Champaign represents a unique opportunity to develop research collaborations in trusted software between researchers at Boeing and the University of Illinois at Urbana-Champaign, resulting in significant benefits to both. "Trusted software" consists of research topics related to the trustworthiness (security, privacy, reliability, availability, correctness, safety, and survivability) of information systems, software, networks, and applications. A central focus of the program is the support of a number of projects expected to lead to innovations that can impact the long-term competitiveness of Boeing in a 5-to-10-year time frame. The relationship is managed by the Information Trust Institute. Topic areas include, but are not limited to:

- Network Security and Protocols
- End-to-End Guarantee of QoS and Trust in Heterogeneous Networking Environments
- Secure and Dependable Networks of Sensors/Embedded Devices
- Highly Scalable Trustworthy Networks for Complex Sensor and Embedded Device Systems
- Scalable Traffic and System Trust Engineering Methods
- Survivability of Distributed Systems
- Algorithms for Trust Assessment, Optimization, and Data Analysis
- Network and Security Management
- New Paradigms for Trustworthy Tactical Networking

• Trustworthy Wireless Networking
• Information Assurance Algorithms, Methods, and Architectures
• Trusted Software for Next-Generation Air Transportation Management Systems

Cement Composite Materials, Center for
Leslie Struble
lstruble@uiuc.edu
2129 Newmark Laboratory
205 North Mathews Avenue
MC-250
Urbana, IL 61801
217-333-2544
http://www.cee.uiuc.edu/research/ccm

The Center for Cement Composite Materials (CCCM) is an interdisciplinary research center that develops knowledge to solve technical problems relating to portland cement and cement-based materials. The center identifies technical problems in the production and use of these materials, designs and carries out fundamental, science-based research to provide the knowledge required to solve these problems, and disseminates results of this research, both directly to center members and more broadly through open scientific literature, education, and the development of new standards. The center has research and analytical facilities available to university faculty and to industry. The center is closely affiliated with the Center for Advanced Cement-Based Materials (ACBM), which is headquartered at Northwestern University (http://www.acbm.northwestern.edu). ACBM was established in 1989 as a National Science Foundation Science and Technology Center, and since 2000 it has been a collaborative industrial research program with approximately 25 companies participating.

Computational Electromagnetics and Electromagnetics Laboratory, Center for
Weng C. Chew, Director
w-chew@uiuc.edu
379 Everitt Laboratory
1406 West Green Street
MC-702
Urbana, IL 61801
217-333-7309
http://www.ccem.uiuc.edu

The Center for Computational Electromagnetics and Electromagnetics Laboratory (CCEML) performs leading-edge research in electromagnetic technology. Research areas include electromagnetic scattering and interaction, solving scattering problems of unprecedented sizes, antenna arrays, inverse scattering, high-speed digital circuits, electro-optics, remote and geophysical sensing, genetic algorithms, and bioengineering. Electromagnetics and antenna research in the laboratory has a long and distinguished history. Frequency-independent (log-periodic) antennas and corrugated horns were invented here, in addition to uniform geometrical theory of diffraction, theory for random arrays, reflectors and lenses, and microstrip antennas. Some recent contributions are the development of fast computational algorithms and analysis techniques, and reconfigurable antennas, as well as antennas for wireless and sensing applications.

Electro-optic Systems Laboratory (EOSL)
Erhan Kudeki and Gary Swenson, Co-directors
304-305 Coordinated Science Laboratory
1308 W. Main Street
MC-228
Urbana, IL 61801
(217) 333-4303
http://eosl.csl.uiuc.edu/home/index.htm

This research group primarily focuses on using remote sensing techniques to investigate the middle atmosphere dynamics and chemistry in the 80-110 km altitude region. Measurements of temperatures, winds, and chemiluminescent chemical processes are important to this chemically and dynamically active atmospheric region. Other important research areas include remote sensing of water vapor in the lower atmosphere, temperatures and atmospheric density in the 20-70 km region, as well as temperature in the thermosphere (100-300 km).

EOSL developed and currently operates the first Na wind/temperature lidar that can measure Na density, temperature and wind in the 80-110 km region at high temporal (1.5 min) and vertical (100 m) resolutions.

A new Fe Boltzmann temperature lidar has been developed in 1997 to measure Fe density and temperatures.

Imagers, spectrometers and photometers operating in the UV-Visible-near IR are used to investigate the airglow and auroral emission from the atmosphere.

Research includes engineering endeavors with space environment and instrumental developments for space and defense applications.

Fluorescence Dynamics, Laboratory for
Enrico Gratton, Director
egratton22@yahoo.com
William Mantulin, Co-Director
mantulin@uiuc.edu
Theodore Hazlett, Co-Director
thazlett@uiuc.edu
Loomis Laboratory
1110 West Green Street
MC-704

Urbana, IL 61801
217-244-5620
http://lfd.uiuc.edu

The Laboratory for Fluorescence Dynamics (LFD) at the University of Illinois at Urbana-Champaign was established in 1986 as a national research resource in biomedical fluorescence spectroscopy, supported by the National Institutes of Health and the University of Illinois at Urbana-Champaign. The aims of the center are to provide a state-of-the-art laboratory for time-resolved fluorescence measurements with technical assistance to visiting scientist/users, and to design, test, and implement advances in the technology, especially in hardware, automation software, and applications to the biomedical arts.

Grainger Center for Electric Machinery and Electromechanics
Philip Krein, Director
machines@eceuiuc.edu
341 Everitt Laboratory
1406 West Green Street
MC-702
Urbana, IL 61801
217-333-4732
http://machines.ece.uiuc.edu

The Grainger Center for Electric Machinery and Electromechanics (CEME) is dedicated to enhancing education, technology, understanding, and research activities in electrical energy, with emphasis on electric machinery. Major research thrusts include the design of machines, physics-based design for electromechanics, efficiency enhancement across the whole range of electric machines, high-reliability energy supply designs for buildings and public facilities, research to develop new semiconductor materials for power applications and machines, and related energy conversion and processing technologies. Programs of the Center and the director's Faculty Chair are supported by an endowment gift from The Grainger Foundation Inc.

Hyper-Uniform Nanophotonic Technologies for Ultra-Fast Optoelectronic Systems, Center of
K. Y. Norman Cheng, Director
kycheng@uiuc.edu
150 Micro and Nanotechnology Laboratory
208 North Wright Street
MC-249
Urbana, IL 61801
217-333-6642
http://www.micro.uiuc.edu/mbe/HUNT_Webpage/index.html

The Center of Hyper-Uniform Nanophotonic Technologies for Ultra-Fast Optoelectronic Systems (HUNT Center) is part of the Defense Advanced Research Projects Agency (DARPA) University Photonics Research Centers program. The mission of the HUNT Center is the development of critical technologies including hyper-uniform, nano-photonic fabrication, high-performance quantum dot vertical-cavity surface-emitting lasers, and ultra-fast light-emitting transistor-based lasers for the realization of ultra-fast (≥100 Gb/s) optoelectronic interconnect systems. The center's goal of demonstrating such ultra-fast optoelectronic interconnect systems requires the ability to design, fabricate, and integrate ultra-high-speed light sources with detector and driver circuits. The HUNT Center's research programs will address the challenges by embracing a newly invented ultra-fast semiconductor laser structure, the light-emitting transistor (LET), and through development of hyper-uniform nanophotonic fabrication methods and novel quantum dot micro-cavity laser technologies. The three-port operation of the LET offers a revolutionary solution to the laser speed barrier problem as well as novel integrated circuit functions.

Illinois Center for Transportation
Imad L. Al-Qadi, Director
alqadi@uiuc.edu
University of Illinois
1611 Titan Drive
Rantoul, IL 61866
217-893-0705
http://www.ict.uiuc.edu

The Illinois Center for Transportation (ICT) is an innovative partnership between the Illinois Department of Transportation (IDOT) and the University of Illinois at Urbana-Champaign (UIUC). ICT builds on the renowned experts in transportation and related fields at UIUC, IDOT, and other Illinois universities by providing the appropriate tools and support required for transportation research.

ICT promotes innovation and progress in transportation through interdisciplinary research in an objective setting. The research at ICT encompasses transportation problems such as safety, congestion, environment, pavements, structures, and materials. Students and faculty from diverse backgrounds work together on cutting edge research. In addition, the center provides students with opportunities to work on real life projects related to constructed facilities, transportation systems, safety, environment, human factors, economy, and policy in cooperation with IDOT professionals in a challenging and diverse research program.

Information Assurance Education at the University of Illinois at Urbana-Champaign, Center for
Roy Campbell, Director
rhc@iti.uiuc.edu
Coordinated Science Laboratory
1308 West Main Street
Urbana, IL 61801-2307
217-244-8920
http://www.iti.uiuc.edu/centers/NSA_IA_Education_Center.html

This center coordinates educational activities in information assurance across the campus of the University of Illinois at Urbana-Champaign (UIUC) and is a member of the Information Trust Institute. UIUC offers many courses and research opportunities in information assurance at the undergraduate and graduate level, including distance learning, short courses, and master's and doctoral degrees. Our courses are matched to the Committee on National Security Systems (CNSS) Training Standards.

The Center for Information Assurance Education has been the driving force behind the effort that resulted in the designation of the University of Illinois at Urbana-Champaign as a Center of Academic Excellence in Information Assurance Education by the National Center of Academic Excellence in Information Assurance Education (CAEIAE) Program, an outreach program initially designed and operated by the National Security Agency (NSA) in the spirit of Presidential Decision Directive 63, National Policy on Critical Infrastructure Protection, May 1998. The goal of the program is to reduce vulnerability in our national information infrastructure by promoting higher education in information assurance (IA), and producing a growing number of professionals with IA expertise in various disciplines.

Information Trust Institute
William H. Sanders, Director
whs@iti.uiuc.edu
451 Coordinated Science Laboratory
1308 West Main Street
MC-228
Urbana, IL 61801
217-244-8920
http://www.iti.uiuc.edu

The Information Trust Institute (ITI) provides national leadership combining research and education with industrial outreach in trustworthy and secure information systems. ITI brings together over 50 faculty, many senior and graduate student researchers, and industry partners to conduct foundational and applied research to enable the creation of critical applications and cyber infrastructures. In doing so, ITI is creating computer systems, software, and networks that society can depend on to be trustworthy; that is, secure, dependable (reliable and available), correct, safe, private, and survivable. Instead of concentrating on narrow and focused technical solutions, ITI aims to create a new paradigm for designing trustworthy systems from the ground up and validating systems that are intended to be trustworthy.

ITI is an academic/industry partnership targeting application areas such as electric power, financial systems, defense, and homeland security, among others. ITI aims to change the way research and education are conducted in the information trust area by closely coupling industry and faculty researchers to create economic opportunity by achieving rapid technology transfer into new products and services and skilled workforce development.

Integrated Microsystems, Illinois Center for
Naresh R. Shanbhag, Director
shanbhag@uiuc.edu
Coordinated Science Laboratory
1308 West Main Street
MC-228
Urbana, IL 61801
217-244-0041
http://www.icims.csl.uiuc.edu

The Illinois Center for Integrated Microsystems (iCIMS) facilitates collaborative research in the design of integrated microsystems, including integrated circuits or chips, devices, system-on-a-chip (SOC), and structures. The center has nine faculty and 40-plus graduate students working on various aspects of microsystem design. Specific projects include the design of high-speed chip-to-chip links, radio frequency CMOS circuits, reliability issues in chips, low-power/high-performance very large scale integrated (VLSI) circuits for broadband communications, and computer-aided design of SOCs. Center activities are funded through industry, the National Science Foundation, the Defense Advanced Research Projects Agency, and the Semiconductor Research Corporation. The center has an industrial outreach program whereby industry can participate in center activities by funding research on specific topics of interest, by sending engineers to work with center faculty and students, and by providing summer internships to students in the center.

Materials Computation Center
Duane Johnson, Director
mcc@uiuc.edu
295 Engineering Sciences Building
1101 West Springfield Avenue
MC-233
Urbana, IL 61801

217-333-3324
http://www.mcc.uiuc.edu

As the Computational Materials Science discipline affects all fields of science and engineering, the Materials Computation Center (MCC) is actively developing powerful, leading-edge methods and tools to analyze and predict the properties of materials. The MCC provides an interactive environment for students, teachers, and researchers focused on world-class, multidisciplinary education and research across traditional boundaries in Computational Materials Science. Research areas evolve but include computer science methods and applications to materials multiscaling, complex systems, computational biophysics, as well as classical/quantum materials simulations. The MCC promotes networking of researchers and students locally and worldwide, sponsors summer schools on current topics such as computational biophysics and nanoscience. The MCC hosts a shared-resource, web-based Software Archive that contains codes fostering research and education, with community contributions welcome. The center also directly supports broader interactions such as the Division of Computational Physics at the American Physics Society and Research Experience for Undergraduates.

The MCC is supported by the National Science Foundation under grant DMR-03-25939 with Principal Investigators Duane D. Johnson (Materials Science and Engineering) and Richard M. Martin (Physics), and housed at Frederick Seitz Materials Research Laboratory and involves over 10 programs, e.g., materials science, physics, chemistry, and computer science.

Microanalysis of Materials, Center for
Ivan Petrov, Director
petrov@uiuc.edu
2015 Frederick Seitz Materials Research Laboratory
104 South Goodwin Avenue
MC-230
Urbana, IL 61801
217-333-8396
http://cmm.mrl.uiuc.edu

The Center for Microanalysis of Materials (CMM) at the Frederick Seitz Materials Research Laboratory provides advanced instrumentation for the characterization of a wide range of advanced materials over the full range of scales from the atomic to the macroscopic. The CMM is an integrated facility containing the full array of modern nanostructural and nanochemical analysis techniques including electron microscopy (SEM, TEM, STEMs, high-pressure environmental cell TEM, high-temperature LEEM, focused ion beam microscopy, scanning probe microscopy, variable-temperature STM), surface microanalysis (SIMS, TOF-SIMS, AES, XPS, imaging XPS, electrochemical XPS), x-ray scattering in all modes, and ion-beam spectroscopies (RBS, channeling and NRA).

The center is staffed with experts in each technique who teach researchers so they can operate the instruments to conduct their own measurements. Licensed users have 24-hour access to the instruments. The CMM staff members also provide guidance, consultation, and collaboration in the microanalysis of materials. Projects are selected on their scientific merit. Approximately 30 companies use the center.

Mid-America Earthquake Center
Amr Elnashai, Director
aelnash@uiuc.edu
1241 Newmark Laboratory
205 North Mathews Avenue
MC-250
Urbana, IL 61801
217-244-6302
http://mae.ce.uiuc.edu

The Mid-America Earthquake Center is one of three national earthquake engineering research centers established by the National Science Foundation. It is headquartered at the University of Illinois at Urbana-Champaign, and is a partnership of nine universities. The focus of the center is on assessment and mitigation of the effects of earthquakes on a regional level, including physical damage and consequential social and economic impact. Toward this end, the center has developed, articulated, and is applying to test bed regions, a new framework for earthquake impact management referred to as Consequence-based earthquake Risk Management, or CRM. The CRM framework guides the center in developing and executing its goals and objectives in research, education, and outreach. The center manages more than 40 research projects in structural and geotechnical earthquake engineering, loss modeling and assessment, social and economic impact and a number of practical projects that serve the needs of leading companies, state and federal agencies as well as overseas partners in earthquake-prone regions. The center supports about 60 students. Comprehensive information on center activities is available at http://mae.cee.uiuc.edu.

Nanoscale Chemical-Electrical-Mechanical Manufacturing Systems, Center for
Placid Ferreira, Director
pferreir@uiuc.edu
4410 Mechanical Engineering Laboratory
105 South Mathews Avenue
MC-244
Urbana, IL 61801

217-265-0093
http://www.nano-cemms.uiuc.edu

The Center for Nanoscale Chemical-Electrical-Mechanical Manufacturing Systems (Nano-CEMMS) was established in 2003 as a National Science Foundation Nanoscale Science and Engineering Center. A partnership of the University of Illinois, the California Institute of Technology, North Carolina Agricultural and Technological State University and Stanford University, Nano-CEMMS' mission is to develop a viable manufacturing technology and science base for fabricating ultrahigh-density, complex nanostructures. Specifically, Nano-CEMMS research focuses on micro-nano fluidic networks, processing sensing and control, manufacturing systems, and applications to organic optoelectronic and combinatorial chemistry.

Nanoscale Science and Technology, Center for
nano@cnst.uiuc.edu
Micro and Nanotechnology Laboratory
208 North Wright Street
MC-249
Urbana, IL 61801
217-333-3097
http://www.cnst.uiuc.edu

Nanoscale technology is the next frontier in our quest to find solutions to problems facing humankind. The Center for Nanoscale Science and Technology (CNST) was established in 2001 at the University of Illinois, Urbana-Champaign, as the premier institution for nanoscale science and technology initiatives.

CNST draws its strength working as a collaboratory towards seamless integration of interdisciplinary research from atoms and materials to devices and systems.

CNST is uniquely located to harness the entrepreneurial and technical spirit in downstate Illinois, with ongoing linkages with the University Research Park, the Illinois Technology and Enterprise Corporation-an initiative of the Illinois Department of Commerce and Economic Opportunity, and the state legislature. Industrial linkages have also been initiated.

CNST also is embarking on developing a curriculum for nanotechnology education, which will transcend a number of campus departments and units. Exceptional students with interest in nanotechnology projects have been awarded fellowships.

Process Simulation and Design, Center for
Robert B. Haber, Director
2262 Digital Computer Laboratory
1304 W. Springfield Ave.
MC-258
Urbana, IL 61801
217-333-3247
http://www.cpsd.uiuc.edu

The Center for Process Simulation and Design (CPSD) is dedicated to improving the quality and performance of products and materials through simulation and optimization of the industrial processes by which they are manufactured. Its initial focus is on understanding and controlling microstructural material properties resulting from casting and extrusion processes. Such problems have multiple length and time scales, moving boundaries, and complex, dynamically evolving geomotries and topologies. This interdisciplinary program includes a broad range of research activities in engineering, mathematics, and computer science.

CPSD is funded primarily by the National Science Foundation (NSF) under the Information Technology Research (ITR) initiative, with joint sponsorship by the Division of Materials Research and the Directorate for Computer and Information Science and Engineering. The initial funding for CPSD was provided by the NSF Division of Mathematical Sciences, the NSF Office of Multidisciplinary Activities, and by the Defense Advanced Research Projects Agency (DARPA).

Simulation of Advanced Rockets, Center for
Michael T. Heath, Director
heath@uiuc.edu
2270 Digital Computing Laboratory
1304 West Springfield Avenue
MC-278
Urbana, IL 61801
217-333-3247
http://www.csar.uiuc.edu

The technical goal of the Center for Simulation of Advanced Rockets (CSAR) is the detailed, three-dimensional, integrated, whole-system simulation of solid propellant rockets. The center seeks to understand the performance of solid propellant rockets under normal and abnormal (accident) conditions. Meeting this daunting challenge requires a multidisciplinary team of engineers, physical scientists, and computer scientists to develop and implement the necessary mathematical models, algorithms, and software to build a virtual rocket. In addition, enormous computational capacity is required to perform the resulting simulated launch scenarios, frequently employing thousands of processors. CSAR is one of five university-based research centers funded by the U.S. Department of Energy as part of the National Nuclear Security Administration Advanced Simulation and Computing Program. The center includes 30 faculty members from eight departments, 35 graduate students,

and 25 research scientists, programmers, and postdoctoral research associates.

Supercomputing Applications, National Center for
Thom H. Dunning, Jr., Director
Danny Powell, Executive Director
NCSA Building
1205 West Clark Street
MC-476
Urbana, IL 61801
217-244-0072
http://www.ncsa.uiuc.edu

The National Center for Supercomputing Applications (NCSA), one of the five original centers in the National Science Foundation's Supercomputer Centers Program, opened its doors in January 1986. Over the past twenty years, NCSA has contributed significantly to the birth and growth of the worldwide cyberinfrastructure for science and engineering, operating some of the world's most powerful supercomputers and developing the software infrastructure needed to efficiently use these systems. Today the center is recognized as an international leader in deploying robust, high-performance computing resources and in working with research communities to develop the new computing and software technologies needed to take full advantage of the rapidly expanding national and international cyberinfrastructure.

The center focuses on three themes. Cyber-environments will give research communities the means to fully exploit the extraordinary resources available on the Internet (computing systems, data sources and stores, and tools). NCSA's cyber-resources ensure that computing, data, and networking resources are available to solve the most demanding science and engineering problems and that the solutions are obtained in a timely manner. Finally, innovative systems research explores the path to petascale computing—testing and evaluating the performance of emerging computing systems for key scientific and engineering applications.

NCSA is a key partner in the National Science Foundation's TeraGrid project, a $100 million effort to offer researchers remote access to some of the fastest unclassified supercomputers as well as an unparalleled array of visualization tools, application software, sensors and instruments, and mass storage devices. NCSA also leads the effort to develop a secure national cyberinfrastructure through the National Center for Advanced Secure Systems Research, a project funded by the Office of Naval Research.

The center leaves its mark through the development of networking, visualization, storage, data management, data mining, and collaboration software as well. The prime example of this influence is NCSA Mosaic, which was the first graphical Web browser widely available to the general public. NCSA visualizations, meanwhile, have been a part of productions by the likes of PBS's NOVA and the Discovery Channel. Through its Private Sector Program, top researchers explore the newest hardware and software, virtual prototyping, visualization, networking, and data mining to help U.S. industries maintain a competitive edge in the global economy.

Major support for NCSA is provided by the National Science Foundation. Additional funding comes from the state of Illinois, industrial partners, and other federal agencies.

TCIP: Trustworthy Cyber Infrastructure for the Power Grid
William H. Sanders, Director
whs@iti.uiuc.edu
451 Coordinated Science Laboratory
1308 West Main Street
Urbana, IL 31801
217-333-0345
http://www.iti.uiuc.edu/tcip/index.html

The TCIP (Trustworthy Cyber Infrastructure for the Power Grid) NSF Cyber Trust Center was created in August 2005 to address the challenge of how to protect the nation's power grid. The National Science Foundation awarded $7.5 million over five years to the project, which will be led by the University of Illinois ITI team and also involve researchers at Cornell University, Dartmouth College, and Washington State University. The Department of Energy and the Department of Homeland Security have pledged to join NSF in funding and managing the effort.

The center will significantly improve the way the power grid cyber infrastructure is built, making it more secure, reliable, and safe. TCIP is working to provide the fundamental science and technology needed to create an intelligent, adaptive power grid that can survive malicious adversaries, provide continuous delivery of power, and support dynamically varying trust requirements. We will do so by creating the necessary cyber building blocks and architecture, and by creating validation technology to quantify the amount of trust provided by the proposed approach.

Technology Entrepreneur Center
Andrew Singer, Director
acsinger@uiuc.edu
College of Engineering
313 Ceramics
105 South Goodwin Avenue
Urbana, IL 61801
217-244-3124

http://www.tec.uiuc.edu

The Technology Entrepreneur Center (TEC) was created in 1999 to enhance the existing engineering curriculum, produce publishable research, and engage the college's vast pool of faculty, students, and alumni supportive of entrepreneurship. TEC's 11 courses and co-curricular activities expose students to the complex concepts inherent in the simultaneous processes of technology innovation and market adoption. The TEC also offers on-site and online certificate programs for education and professional development, as well as hosts outreach activities for students and alumni, such as the Illini-TEC forums, in several major cities. The TEC also hosts the annual Cozad business plan competition, as well as the Lemelson-Illinois Student Prize for Innovation. Although part of the College of Engineering, the center is interdisciplinary, having affiliated faculty members from several departments and colleges. TEC faculty members have produced an impressive body of collaborative research and publications in both theoretical and applied disciplines.

Theoretical Astrophysics, Center for
Frederick K. Lamb, Director
thorman@uiuc.edu
c/o Linda S. Thorman
339 Loomis Laboratory, MC-704
1110 West Green Street
Urbana, IL 61801
217-333-6363
http://www.physics.uiuc.edu/Research/CTA

The Center for Theoretical Astrophysics (CTA) addresses important current problems in theoretical astrophysics, general relativity, and cosmology. The center's research is highly interdisciplinary. Projects use knowledge of many different areas of physics and astronomy—including high-energy processes, radiation hydrodynamics, atomic physics, plasma physics, magnetofluid dynamics, general relativity, and condensed matter physics—to interpret astronomical data and model successfully the astrophysical objects and phenomena being studied. Members of the center, who work with collaborators worldwide, include faculty in the Departments of Physics and Astronomy and members of the National Center for Supercomputing Applications.

Trusted ILLIAC Center
Ravishankar K. Iyer, Director
rkiyer@iti.uiuc.edu
Coordinated Science Laboratory
1308 West Main Street
Urbana, IL 61801-2307
217-244-8920

http://www.iti.uiuc.edu/centers/TrustedIlliac.html

The goal of Trusted ILLIAC is a large, demonstrably trusted cluster computing platform to support what is variously referred to as "on-demand/utility computing" or "adaptive enterprise computing. A unique feature of the infrastructure is the massive use of reconfigurable hardware , which enables rapid design and deployment of low-cost application-aware hardware engines and a supporting OS and middleware configuration that provide an unparallel opportunity to devise systems and applications with provable security and reliability guarantees. Tools and well-defined procedures will support configurability of system services exposed to end users, including error and intrusion detection, security vulnerability masking, and recovery.

A distinctive integral part of the Trusted ILLIAC is a validation framework , which constitutes a cornerstone for quantitative assessment of alternative designs and solutions. Such evaluation is crucial in making design decisions, which require understanding of trade-offs such as cost (in terms of complexity and overhead) versus efficiency of proposed mechanisms. The framework leverages years of experience we have in experimental evaluation of highly reliable and secure systems and is based on comprehensive fault and attack injection technology and tools developed at Illinois.

Finally, a collection of well-defined communication gateways (or APIs) facilitates robust low-overhead information flow between system layers in the trusted architecture while preserving the established reliability and security guarantees and relationships. In a broader context, Trusted ILLIAC provides low-cost configurable architecture, which offers state-of-the-art, highly customizable computing technology to the broader community of students, researchers, and institutions to enable them to create their own integrated trusted computing test beds. The infrastructure benefits technology transfer efforts from research to real-world environments and enables researchers to collaborate with developers from the government and industry to determine how trustworthy hardware assists and software stacks can be integrated into products.

WaterCAMPWS, Advanced Materials for Purification of Water with Systems, Center of
Mark A. Shannon, Director
watercampus@uiuc.edu
2127 Mechanical Engineering Lab
1206 West Green St.
MC-244
Urbana, IL 61801
217-333-2633

http://www.watercampws.uiuc.edu

The WaterCAMPWS (Center of Advanced Materials for Purification of Water with Systems) is a National Science Foundation Science and Technology Center that involves scientists, engineers, educators and other personnel principally from the University of Illinois at Urbana-Champaign, Clark Atlanta University, Howard University, Massachusetts Institute of Technology, Rose-Hulman Institute of Technology, University of California at Berkeley, University of Michigan, University of Notre Dame, and Yale University. The WaterCAMPWS missions are to develop revolutionary new materials and systems to safely and economically purify water for the peoples of the U.S. and world, and to develop the human resources to advance the science and technology of water purification. The WaterCAMPWS is a research and education center for increasing water supplies for human use through enhanced treatment technologies.

Advanced Materials Testing and Evaluation Laboratory
Peter Kurath, Director
p-kurath@uiuc.edu
204 Talbot Laboratory
104 South Wright Street
MC-262
Urbana, IL 61801
217-333-3751
http://www.mie.uiuc.edu/content/about/research/research_lab_profile.php?lab_id=1

The Advanced Materials Testing and Evaluation Laboratory (AMTEL/M&IE) is a state-of-the-art facility for mechanical testing of coupon specimens to determine baseline engineering properties and more sophisticated biaxial testing. Equipment to test components and smaller structures has also been developed. AMTEL is supported by user fees from industrial and research contracts and supplemented by funds from the Department of Mechanical and Industrial Engineering.

Advanced Research in Information Security, Center for
Roy H. Campbell, Director
roy@cs.uiuc.edu
Thomas M. Siebel Center for Computer Science
201 North Goodwin Avenue
MC-258
Urbana, IL 61801
217-265-5225
http://www.caris.uiuc.edu

The Center for Advanced Research in Information Security (CARIS), a collaborative partnership between the University of Illinois and Argus, allows academic, government, and industrial institutions to team together. Its mission includes promoting and conducting research and development, promoting quality multidisciplinary education, increasing university and community awareness, and influencing appropriate and effective public policy in the areas of infrastructure and information system security.

To achieve these goals, CARIS is aggressively pursuing state and federal funding opportunities. Proposed research projects to date include the development and marketing of products that implement domain-based access controls that defend systems against attacks and halt the spread of viruses and worms. An additional project is targeted at the construction and deployment of a security infrastructure for integrated information security.

The University of Illinois is a National Security Agency Center of Academic Excellence for Information Assurance Education.

Air Conditioning and Refrigeration Center
Predrag S. Hrnjak and Anthony M. Jacobi, Co-Directors
acrc@uiuc.edu
Department of Mechanical and Industrial Engineering
1206 West Green Street
MC-244
Urbana, IL 61801
217-333-3115
http://acrc.mie.uiuc.edu

The Air Conditioning and Refrigeration Center (ACRC), established by the National Science Foundation in 1988, conducts industry–university cooperative research on energy-efficient, environmentally sound technologies for human comfort, environment control, food preservation and transportation, and other applications. The ACRC provides a forum for industry and university researchers to coordinate research with long-term value. Graduate students and faculty members from across the College of Engineering pursue advanced study in acoustics, dynamics, control systems, design, materials, and the thermal sciences. The ACRC is an active collaboration between approximately 30 companies in industry and the university.

Airport Technology, Center of Excellence for
David A. Lange, Director
dlange@uiuc.edu
1117 Newmark Civil Engineering Laboratory
205 North Mathews
MC-250
Urbana, IL 61801
217-333-7501

http://cee.uiuc.edu/research/ceat/

The Center of Excellence for Airport Technology (CEAT) draws resources from the University of Illinois and several other universities to conduct basic, developmental, and applied research in airport technology. CEAT is sponsored by both the Federal Aviation Administration (FAA) and the O'Hare Modernization Program (OMP). The FAA is supporting research in pavement structural modeling, concrete fatigue studies, asphalt overlay design, base and subgrade material characterization, pavement response analysis, airport safety, and wildlife hazards. OMP is supporting research in subgrade stabilization, raw materials for concrete production, and concrete pavement behavior. In addition, the center has developed an outreach program that encompasses a Summer Minority Student Internship Program and a Minority Contractor Outreach Program in Chicago. Portions of the research and testing are performed at the Advanced Transportation Research and Engineering Laboratory (ATREL) in Rantoul, Illinois.

Bio-Optoelectronic Sensor Systems, Center for
K. Y. Norman Cheng, Director
kycheng@uiuc.edu
150 Micro and Nanotechnology Laboratory
208 North Wright Street
MC-249
Urbana, IL 61801
217-333-6642
http://www.micro.uiuc.edu/boss/Title.html

The Center for Bio-Optoelectronic Sensor Systems (BOSS) is part of the Defense Advanced Research Projects Agency (DARPA) university center program. The goal of the center is the development of integrated optoelectronic technologies, including materials, devices, integrated interferometers, optical microelectromechanical system (MEMS) spectrometers, and heterogeneous integration that are critical to the realization of integrated and reconfigurable biological and biochemical sensor systems. Microspectrometer and interferometer-waveguide–based optoelectronic biosensor systems will be developed to improve the size, cost, sensitivity, and signature resolution of the fieldable sensors for detecting biological and chemical entities in the environment in real-time through on-chip optical measurements. The center will utilize compound semiconductor optoelectronic systems integrated with MEMS fabrication techniques, molecular biology methods, and information fusion algorithms to attain integrable and reconfigurable optoelectronic biosensor chips.

Complex Systems Research, Center for
Alfred W. Hubler, Director
a-hubler@uiuc.edu
4-129 Engineering Sciences Building
1110 West Springfield Avenue
MC-704
Urbana, IL 61801
217-244-5892
http://www.ccsr.uiuc.edu

The Center for Complex Systems Research (CCSR) is an interdisciplinary group of faculty members and graduate students administered through the Department of Physics. This group investigates a variety of complex dynamic processes occurring in biology, physics, chemistry, astronomy, and engineering. It considers not only specific dynamic problems but also the generic aspects of adaptive dynamic modeling and control that can be applied to any of the natural sciences or engineering. Major funding for the center is provided by a grant from the Office of Naval Research and the National Science Foundation.

Computational Science and Engineering
Michael T. Heath, Director
heath@uiuc.edu
2270 Digital Computer Laboratory
1304 West Springfield Avenue
MC-278
Urbana, IL 61801
217-333-0654
http://www.cse.uiuc.edu

Computational science and engineering (CSE) is inherently interdisciplinary, requiring expertise in advanced computing technology as well as in one or more applied disciplines. The purpose of the CSE program at the University of Illinois is to foster interdisciplinary, computationally oriented research among all fields of science and engineering and to prepare students to work effectively in such an environment.

Students electing the CSE option become proficient in computing technology, including numerical computation and the practical use of advanced computer architectures, as well as in one or more applied disciplines. Such proficiency is gained, in part, through courses that are specially designed to reduce the usual barriers to interdisciplinary work. Thesis research by CSE students is expected to be computationally oriented and actively advised by faculty members from multiple departments.

In addition to its educational programs, CSE is also the administrative home of several interdisciplinary research centers, including the Center for Simulation of Advanced Rockets (funded by the Department of Energy) and the Center for Process Simulation and Design (funded by the

National Science Foundation). Websites for these centers are at http://www.csar.uiuc.edu and http://www.cse.uiuc.edu/cpsd, respectively.

Continuous Casting Consortium
Brian G. Thomas, Director
bgthomas@uiuc.edu
356 Mechanical Engineering Building
1206 West Green Street
MC-244
Urbana, IL 61801
217-333-6919
http://ccc.me.uiuc.edu

The Continuous Casting Consortium (CCC), created in 1991, consists of several companies in the steel industry that have been supporting research on the continuous casting of steel at the University of Illinois at Urbana-Champaign. The consortium encompasses a cooperative research effort to develop comprehensive mathematical models of continuous casting and related processes and to apply these models to improve fundamental understanding, to optimize the industrial processes, and to solve practical problems of interest to the participating members and to the steel industry in general. In addition to funding, the members provide plant data and direction to the research. Funding is augmented by grants from the National Science Foundation and other agencies.

Decision and Control Laboratory
Mark Spong, Director
mspong@uiuc.edu
149 Coordinated Science Laboratory
1308 West Main Street
MC-228
Urbana, IL 61801
217-333-4281
http://black.csl.uiuc.edu/~dcl

Members of the Decision and Control Laboratory conduct research on a broad spectrum of topics covering systems, control, and decision-making, encompassing both theory and applications. The Decision and Control Laboratory is active in both the theory and application of feedback control. The group's research has applications in robotics, intelligent control systems, discrete-event systems, semiconductor manufacturing, mathematical economics, aircraft flight control under icing conditions, and information technology. In information technology, the research group is pioneering some exciting work in controlling the traffic of communication packets on high-speed networks in both wired and wireless worlds, even exploring the control of objects at distant locations over networks.

Grainger Engineering Library Information Center
William H. Mischo, Director
1301 West Springfield Avenue
MC-294
Urbana, IL 61801
217-333-3576, fax: 217-244-7764, TDD: 217-244-4580
http://www.library.uiuc.edu/grainger

The Grainger Engineering Library Information Center is a five-floor, 92,000 square-foot facility. The building can seat 1,200 patrons, can accommodate 350,000 volumes of library materials, and has the capability of supporting 1,000 networked computer connections. The Grainger Library provides a focal point for the College of Engineering faculty, students, and staff by making available group study rooms, individual study carrels, faculty and scholar studies, and conference and seminar rooms. It also provides state-of-the-art computing and information technologies to assist students in research and instruction and to provide patrons access to information resources held locally and available on the Internet.

The Grainger Library contains a two-story Main Reading Gallery, which can seat 1,254 people, and two smaller, two-story pavilion reading galleries, which can each accommodate approximately 60 people. The galleries are also used for special events and dinners. In addition, the facility contains three large seminar rooms (seating 30 to 50 people) and four smaller conference rooms.

Grainger Library computing facilities include two computer and multimedia labs with 80 high-end engineering workstations, which are used for CAD, numerical analysis and modeling, and software development; a digital imaging lab housing the Digital Library Initiative Projects, which provides access to 62,000 full-text journal articles; an information retrieval laboratory for visitors and researchers utilizing Grainger and campus resources; and two instructional services labs, which serve as high-tech classrooms for information literacy instruction and presentations.

Throughout the building, public-use terminals provide access to a statewide online catalog, Compendex, INSPEC, Aerospace Database, National Technical Information Service (NTIS), 1,000 full-text journals, and a wealth of local information resources.

The public terminals utilize an intelligent Web-based user interface and serve as the primary access mechanism for the statewide online catalog containing approximately 10 million holdings; a variety of periodical index databases, which provide access to 10 million articles, journals, magazines, and conference proceedings; Grainger journal information on received issues and linked tables of holdings; Engineering Documents Center publications; FAQs; and hard-to-find references. A "Help

Getting Started" module is available to guide library users to information resources.

The Grainger Library contains 260,000 volumes of journals, books, reports, standards, theses, conference proceedings, and other materials. Holdings include 1,100 ongoing journal subscriptions and a large number of continually received conference and series publications.

The Grainger Library has become a popular place for students and faculty members to meet and interact. The workstation computing and information retrieval capabilities of Grainger are heavily utilized. More than 1.5 million people used the building during 2000. The Grainger Engineering Library Information Center is dedicated to providing tools to assist people in their pursuit of knowledge and to serve as a showcase for the applications of information technologies. The Grainger Library home page provides access to Grainger resources.

The Grainger Engineering Library Information Center opened to the public in March 1994. A $22 million multifunctional facility, Grainger Library was primarily funded by a gift of $18.7 million from The Grainger Foundation Inc., which is headquartered in Skokie, Illinois. An additional $11 million of state and gift funds was expended on the project for the rerouting of steam, electrical, and telecommunications lines; the demolition of several buildings; and the construction of the new Engineering Quad (which had been under consideration since at least 1926). The Grainger Library is named after William Wallace Grainger, a 1919 graduate of the University of Illinois College of Engineering. A bas-relief of William Wallace Grainger is in the first floor lobby of the Grainger Library.

High-Performance Computing Laboratories
Robert D. Skeel and David A. Padua, Co-Chairs
padua@a.cs.uiuc.edu
Digital Computer Laboratory
1304 West Springfield Avenue
MC-258
Urbana, IL 61801
217-333-2727, 217-333-4223
http://hpc.cs.uiuc.edu

This is an umbrella group of laboratories in the Department of Computer Science involving more than a dozen faculty members who are collaborating on a variety of funded research projects in high-performance computing. Current efforts are in the areas of parallel computer architecture design, parallelizing compilers, concurrent programming languages, run-time software for parallel I/O and computation, and software and algorithms for applications such as rockets and molecular simulation. This work is facilitated by access to large-scale parallelism through affiliations with campus research centers, including the National Center for Supercomputing Applications and the Center for Simulation of Advanced Rockets.

Image Laboratory: Multimedia Signal Processing, Analysis, and Visualization
Thomas Huang, Director
huang@ifp.uiuc.edu
Beckman Institute
405 North Mathews Avenue
MC-251
Urbana, IL 61801
217-244-1638
http://www.beckman.uiuc.edu/research/hciihome.html

The Image Lab was established under two National Science Foundation Research Infrastructure grants and carries out basic research in a wide spectrum of topics in multimedia (especially image/video and audio) signal processing, analysis, and visualization. Research activities include image databases content and similarity-based retrieval and the use of relevance feedback to adapt the system to the user; video databases (creation of table of contents and semantic index); multimodal human–computer interface (speech- and gesture-based interface in virtual environments using computer lip-reading to enhance audio speech recognition), combining eye tracking and speech in display control; image and video compression; computerized imaging (computer tomography, magnetic resonance imaging, and synthetic aperture radar); and parallel algorithms and architectures for multimedia signal processing. More than 10 faculty members and 50 graduate and undergraduate students are affiliated with the laboratory.

Machine Tool Systems Research, Center for
Shiv G. Kapoor, Director
sgkapoor@uiuc.edu
158 Mechanical Engineering Building
1206 West Green Street
MC-244
Urbana, IL 61801
217-333-3432
http://mtamri.me.uiuc.edu/cmtsr.home

The Center for Machine Tool Systems Research (CMSTR) is an industry-driven center of excellence in manufacturing research to foster collaborative research initiatives between the university and industry represented by both large and small companies. CMSTR builds upon the strengths of the University of Illinois in areas of manufacturing research and education. Particular areas of attention include agile/flexible machining and machine

tool systems, concurrent engineering as it applies to better understanding and utilizing machining process capability upstream during product engineering, machining process development and innovation, and machine-tool planning and control.

Through industrial memberships and participation, the center focuses its attention on leveraging the investments of the industrial memberships as well as its own resources to improve manufacturing competitiveness in the world economy. The center conducts collaborative research projects with its member companies, educates students in the problems and issues of manufacturing, and provides a broader access for its members to the laboratories and programs of the university. The center is unique in that it has both company-designated and center-designated projects. A member company can designate that one-half of the funds it contributes be applied to research of a specific interest to that company. The results of the research from these company-designated projects are available on an exclusive basis to the company. The remaining funds from each company are employed collectively to support center-designated projects, the results of which are shared by all of the participating companies.

Manufacturing Research Center
Shiv G. Kapoor, Director
sgkapoor@uiuc.edu
158 Mechanical Engineering Building
1206 West Green Street
MC-244
Urbana, IL 61801
217-333-3432
http://mtamri.me.uiuc.edu/cmtsr.home.html

The Manufacturing Research Center focuses its attention on leveraging the investments of industrial memberships and its own resources to improve manufacturing competitiveness in the world economy. Particular areas of focus include agile/flexible machining and machine tool systems; concurrent engineering as it applies to better understanding and utilizing machining process capability upstream during product engineering; machining process development and innovation; and machine-tool planning and control.

The center conducts collaborative research projects with its member companies, educates students in the problems and issues of manufacturing, and provides a broader access for its members to the laboratories and programs of the University of Illinois. A member company pays an annual fee and can designate that one-half of the funds contributed be applied to research of specific interest to that company. The results of the research from company-designated projects are available on an exclusive basis to the company. The remaining funds from each member company are employed collectively to support center-designated projects. The results of these projects are shared by all member companies.

Motorola Center for Communications
Ravi K. Iyer, Director
rkiyer@uiuc.edu
202 Coordinated Science Laboratory
1308 West Main Street
MC-228
Urbana, IL 61801
217-333-2510
http://www.csl.uiuc.edu/mcc

The technical scope of the Motorola Center for Communications spans the full range of technologies related to communications. It reflects the tremendous depth and breadth of strength in relevant disciplines in the College of Engineering at the University of Illinois at Urbana-Champaign and at Motorola. A central focus of the program is the support over several years of approximately 22 research projects conducted by Motorola-sponsored graduate research assistants with faculty advisors in the center and close contact with leading Motorola engineers. The current technical emphasis falls into the areas of wireless communication, multimedia (video, speech, and data) signal processing, Internet-driven technologies, communications networking, and mobile computing.

Power Affiliates Program
Peter Sauer, Director
sauer@ece.uiuc.edu
337 Everitt Laboratory
1406 West Green Street
MC-702
Urbana, IL 61801
217-333-0394
http://power.ece.uiuc.edu

The Power Affiliates Program consists of industrial members who provide funding and industrial interaction for the power and energy systems area in the Department of Electrical and Computer Engineering. The program currently has 11 industrial members and holds an annual review meeting every May. The objectives of the program are to bring focus to the power and energy systems area; provide financial assistance to students studying electric power engineering; and increase university–industrial interaction at all levels of education and research in electric power engineering.

Power Systems Engineering Research Center
Peter Sauer, Site Director
sauer@ece.uiuc.edu
337 Everitt Laboratory
1406 West Green Street
MC-702
Urbana, IL 61801
217-333-0394
http://www.pserc.wisc.edu

The Power Systems Engineering Research Center (PSERC) is a Multi-University National Science Foundation Industry/University Cooperative Research Center comprising 13 universities, including the University of Illinois at Urbana-Champaign. PSERC receives industrial funding from about 35 industrial members. The funds are used to perform research into the technical issues of electric power system restructuring. Each industrial member is represented on the Industrial Advisory Board, which meets twice per year to review activities and make decisions about project funding.

Reliable and High-Performance Computing, Center for
Ravi K. Iyer and Janak H. Patel, Co-Directors
255 Coordinated Science Laboratory
1308 West Main Street
MC-228
Urbana, IL 61801
217-333-2510 (Iyer); 217-333-6201 (Patel)
http://www.crhc.uiuc.edu

The Center for Reliable and High-Performance Computing (CRHC) focuses on integrating research in the areas of reliable computing, high-performance architectures, dependability, security, testing, distributed and network computing, and optical and wireless networking. Research funding for the center comes from both industry and government. The center includes 25 faculty members and senior research staff and more than 100 graduate research assistants.

Silicon Nanoelectronics and Quantum Computers, Center for
John Tucker, Director
jrtucker@uiuc.edu
266 Engineering Sciences Building
1101 West Springfield Avenue
MC-233
Urbana, IL 61801
217-333-4810

The Center for Silicon Nanoelectronics and Quantum Computers is committed to developing a process for patterning atom-scale devices and growing them into the silicon crystal lattice. That capability will be used to explore new possibilities for computation based on the quantum states of individual electrons. An important part of this effort will be to integrate atom-scale electronics with conventional metal-oxide semiconductor (MOS) transistors on the same chip in order to explore a wide range of possibilities including single-electron circuits, quantum cellular automata, neural networks, and quantum computers. The center is currently funded by the Defense Advanced Research Projects Agency (DARPA) and, more recently, by the National Science Foundation's Nanoscale Interdisciplinary Research Teams (NSF NIRT) program. Faculty and staff are drawn from the University of Illinois, Utah State University, University of California at Berkeley, Yale University, and Lawrence Berkeley National Laboratory.