

# CURRENT TRANSMISSIONS



## DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

MISSOURI UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
Formerly UNIVERSITY OF MISSOURI-ROLLA

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## 2015 Calendar of Events

### Spring 2015

Open House .....	FEB 16
Hasselmann House Donor Dinner .....	Mar 13
Hasselmann Alumni House Dedication.....	Mar 14
Recess--St. Patrick's .....	MAR 12-15
Spring Break.....	MAR 22-29
Open House .....	APR 3
Philanthropy Week.....	APR 13-18
Board of Trustees Meeting .....	APR 15-16
Woman of the Year.....	APR 15
Alumni Board Committee Meetings .....	APR 17
Battle of the Brains Scholarship Dinner .....	APR 17
Alumni Board Meeting.....	APR 18
Proud Miner Picnic (tentative).....	APR 22
Remmers Lecture-Condoleezza Rice.....	MAY 14
Professional Degree Dinner .....	MAY 15
Professional Degree Breakfast .....	MAY 16
May Commencement .....	MAY 15,16
Golden Alumni Reunion.....	MAY 19-20

### Fall 2015

Semester begins .....	AUG 24
Labor Day Holiday .....	SEP 7
Homecoming 2015 (tentative).....	OCT 23
Thanksgiving Holiday.....	NOV 22-29
Professional Degree Dinner .....	DEC 18
Professional Degree Breakfast .....	DEC 19
December Commencement.....	DEC 18,19

## Electrical and Computer Engineering Academic Scholars

### Spring 2014

Electrical Engineering (103)  
Computer Engineering (59)

### Contact Current Transmissions

If you would like to contact us for any reason, you can reach us by phone at (573)341-4543 or by email at [ece\\_alum@mst.edu](mailto:ece_alum@mst.edu). Our mailing address is:  
Electrical & Computer Engineering  
**MISSOURI UNIVERSITY OF SCIENCE & TECHNOLOGY**  
144 Emerson Electric Co. Hall  
301 W. 16th Street  
Rolla, MO 65409-0040  
ATTN: Current Transmissions

## Keep in Touch with ELECTRICAL & COMPUTER ENGINEERING!

We enjoy keeping you informed about ELECTRICAL & COMPUTER ENGINEERING at MISSOURI S&T. We'd like to hear from you too! Let us know where you are and what you are doing. If you have received an award, promotion, or have a family or professional news you would like to share, please complete this form and mail to: ELECTRICAL AND COMPUTER ENGINEERING, MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY, 144 EECH, 301 W. 16th Street, Rolla MO 65409-0040 or email [ece\\_alum@mst.edu](mailto:ece_alum@mst.edu).

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Email: \_\_\_\_\_ Graduation Year and degree(s): \_\_\_\_\_

Mailing Address: \_\_\_\_\_

\_\_\_\_\_

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Job Title: \_\_\_\_\_

Business name and address: \_\_\_\_\_

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News or comments: \_\_\_\_\_

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# A Message From The Chair



Dear Alumni, Colleagues, and Friends,

What an exciting time to be a part of Electrical and Computer Engineering at Missouri S&T! We've seen a number of changes to the department and campus. The biggest change for the department (certainly for me) was that Dr. Kelvin Erickson stepped down as the Department Chair. Over the last 12 years, Dr. Erickson has led the department through some phenomenal growth in terms of the number of students and the research productivity, has seen the development of a cooperative degree program with Missouri State University, and has seen the start of a now thriving distance education program. Through it all, ECE has maintained its dedication to delivering a first-class educational experience to our students and providing them with the best possible opportunities as they graduate. Our students have always been our first priority, and that will not change! Dr. Erickson will certainly be missed in his role as the Department Chair, but won't be missed from our hallways. He is returning to his first love of teaching and performing research as a regular faculty member.

If you've made it this far, you've probably guessed that it was my great honor to have been selected by the ECE faculty and the Provost to take over as the new De-

partment Chair. I can't think of a better department to lead! We have some of the country's most intelligent, creative, and hardworking students and alumni. We have faculty who are not only world-renowned for their research but who also care deeply for the students, their education, and their future. We also have staff who are devoted to the students and faculty and who do a great job keeping the department running. I've made this department my second home for the last 16 years. I'll do everything I can to ensure ECE continues to build terrific futures for our students and to be a great place for the students, faculty, and staff to work and learn.

Another big change for Missouri S&T: we're back to having Deans! Dr. Ian Ferguson is the new Dean of Engineering and Computing. When Missouri S&T took on new Deans, we also got a new Provost, Dr. Robert Marley. Dr. Marley and Dr. Ferguson have their work cut out for them as they build the new School of Engineering and Computing. I'm looking forward to their help moving our University to the next level. Within our department we've also hired four new faculty. They will be fantastic additions to our team.

It is no surprise to me that our faculty and students won a number of awards this past year that demonstrate the outstanding quality of our department. Two of our faculty were elevated to IEEE Fellow status, bringing the total number of IEEE Fellows in the department to nine! The IEEE Fellow grade is one of the highest honors bestowed by IEEE, with no more than 0.1% of IEEE members receiving the elevation in a given year. Few departments are lucky to have such a high percentage of faculty with this distinguished recognition of excellence. I'm sure you'll enjoy reading about this and all of the other prestigious national and international awards won by our faculty and students in the following pages.

As always, I want to express my sincerest thanks to all the alumni who have donated their time and money to the department. Last year, alumni donated \$100,015 to our department through the phonathon. Outstanding! The department also benefited from significant additional funds provided through alumni endowments. These donations helped us to support senior design projects, to fund activities by our student organizations like HKN, IEEE, and the Radio Club, to renovate labs, to help new faculty start successful careers as teachers and scholars, and to give scholarships to deserving young students to help them on their way toward their own successful careers. One major impact of alumni donations is that they allowed us to make a \$160,000 overhaul of the controls lab – a task that has been badly needed for many years. Donations also allowed us to make nearly \$95,000 in scholarship awards to our students. Special thanks are due to the family and friends of Dennis Clodfelter, EE'80, who this year established the Dennis Clodfelter Memorial Scholarship Endowment Fund. I cannot emphasize enough what a huge difference the alumni make to our department! The fact is that the University is not supported by the State as it was in the past, and we count on our alumni to help us provide our students the best, most rewarding educational experience. The help from our alumni makes an immeasurable impact on the lives of our young students, and will not be forgotten. Thank you!

I hope this letter finds you in good health and spirits. If your travels take you by Rolla, please feel free to stop by for a visit. We would love to see you!

Daryl Beetner  
January, 2015

## Meet the New Faculty



**Dr. Amardeep Kaur** joined the ECE department as an assistant teaching professor in August of 2014. Dr. Kaur received her PhD from the department of Electrical Engineering at Missouri University of Science and Technology in December 2014. She received her MS EE from Missouri S&T, then the University of Missouri-Rolla, in May 2009.

She has published several articles in journals like Smart Materials and Structures and Optics Letters and has presented papers at SPIE and ASEE conferences. Her research interests are Engineering Education, Electronics, Optical Engineering and

Smart structures. Her in-lab research has primarily been focused on developing, fabricating and testing optical fiber sensors for in-situ monitoring of structures like airplane wing, which will be her main focus in the future, and bridge columns, etc.

She enjoys teaching introductory computer and electrical engineering courses. Her other teaching interests include electronics, circuits and optics. She is looking forward to bring more hands-on learning into the department by bringing in examples of technological advancements into the classroom. She is currently working on redesigning the Circuits I lab (EE 2101) to make it available for off-campus or distance students. The redesigned lab will entail sending component kits to the students taking the course at off-campus locations and guiding them through the labs online. Software based analysis tools will be incorporated to replace oscilloscope and curve-tracer type bulky hardware equipment.

She is a member of IEEE, HKN-IEEE, SWE and ASEE. She serves as a reviewer for Chinese Optics Letters. She also serves as an advisor to the India Association and a co-advisor to the IEEE student chapter at Missouri S&T.



**Dr. Victor V. Khilkevich** joined the ECE department as an assistant professor in August 2014. He received his Ph.D. degree in electrical engineering from Moscow Power Engineering Institute (Technical University), Moscow, Russia, in 2001. He has been working at the Missouri University of Science and Technology first as a postdoctoral fellow and then a research faculty. He has been an Assistant Professor at the Missouri University of Science and Technology since August 2014. He published a number of papers in the IEEE Transactions on Electromagnetic compatibility and in conference proceedings. His primary research interests include microwave imaging, automotive electromagnetic compatibility modeling, and high frequency measurement techniques. Currently he is working on super-resolution techniques for microwave microscopy, that would allow EMC engineers to locate sources of EMI in electronic systems with high accuracy.

His primary research interests include microwave imaging, automotive electromagnetic compatibility modeling, and high frequency measurement techniques. Currently he is working on super-resolution techniques for microwave microscopy, that would allow EMC engineers to locate sources of EMI in electronic systems with high accuracy.



**Dr. Jhi-Young Joo** joined ECE as an assistant professor in August 2014. She received her Ph.D. from the Department of Electrical and Computer Engineering at Carnegie Mellon University in September 2013, and worked as a postdoctoral researcher in the same department until June 2014. She received her Bachelor's and Master's Degrees from the School of Electrical and Computer Engineering at Seoul National University, Korea in 2005 and

2007, respectively. She has published several articles in journals including IEEE Transactions on Power Systems and on Smart Grid, three book chapters, and many IEEE conference proceedings. Her recent paper titled "Distributed Scheduling Of Demand Resources In A Congested Network" with Prof. Marija Ilic received the Best Conference Paper on Integrated Power System Operations in 2014 IEEE Power and Energy Society General Meeting. Her research interests include modeling and optimization of electric power system operations, demand management in power systems, and electricity markets. Her recent research effort focuses especially on how to operate microgrids in relation with the rest of a large power system. She is excited to work within the excellent power program in ECE that offers many power-related undergraduate/graduate courses, and to take advantage of the research infrastructure at S&T such as the microgrid in the Solar Village.

**Dr. Mihail Cutitaru** joined the ECE department as an Assistant Teaching Professor in the Fall 2014 semester. He received his Ph.D. in Electrical and Computer Engineering from Old Dominion University in August 2014. His research interests are in the areas of Computer Architecture, VLSI Design, Low-Power Computing, and Hardware Security. His teaching experience and interests are in the areas of Digital Logic, Computer Architecture, Microcontrollers, Advanced Digital Design, FPGAs, Computer Security, and Networking. His current work focuses on developing and fabricating a 32-bit microprocessor using a new type of logic in order to achieve very low power operation while maintaining the security of processed data. At S&T, he has been teaching classes in Digital Logic, Microcontrollers, and Computer Architecture, and serving as an advisor for the IEEE Robotics team. He is a member of IEEE and ACM.



## Awards Won by ECE Faculty

- **Dr. Rosa Zheng** elevated to **IEEE Fellow** for contributions to channel modeling and equalization for wireless communications (see pg. 8). The IEEE fellow grade is given to less than 0.1% of IEEE members each year, and is one of IEEE's highest honors.
- **Dr. David Pommerenke** elevated to **IEEE Fellow** for his contributions to system-level electrostatic discharge technology (see pg. 8).
- **Dr. Jun Fan** won the **S&T Faculty Research Award**, one of Missouri S&T's top awards recognizing excellence in research and scholarship.
- **Dr. Kristen Donnell** won the **S&T Faculty Teaching Award**, one of Missouri S&T's top awards recognizing excellence in teaching-related activities.
- **Drs. Yiyu Shi and Jonathan Kimball** won the **Missouri S&T Faculty Excellence Award**. This award recognized faculty who have demonstrated sustained excellence in teaching, research, and service.
- In addition to the Faculty Excellence Award, **Dr. Yiyu Shi** won a number of other awards in 2014, including the **St Louis Academy of Science Innovator Award** for demonstrating exceptional potential for future accomplishments in science, engineering, and technology and the **IEEE St. Louis Chapter Award** for Outstanding Educator, and he became a **Japan Society for the Promotion of Science Faculty Invitation Fellow**. He was also the recipient of a prestigious **Career Award from the National Science Foundation** (see pg. 6).
- **Dr. Chengshan Xiao** won the **IEEE Communications Society Joseph LoCicero Award** for exemplary service to IEEE Communications Society publications. He also won the prestigious **Humboldt Research Award** (See picture). This award, valued at \$60,000 euros, recognizes researchers who have made a significant impact on their discipline over their career.
- **Dr. Mohammad Tayeb Ghasr** won a number of prestigious international awards over the last year. These include the **IEEE Instrumentation and Measurements Society J. Barry Oakes Advancement Award** for demonstrated contributions to instrumentation and measurement science and engineering, the **2015 American Society for Nondestructive Testing Research Award** for Innovation, and the **IEEE Instrumentation and Measurements Society** award for Outstanding Young Engineer.
- **Dr. Rohit Dua** won the **S&T Experiential Learning Award** for development and application of innovative teaching materials and methods.
- Our faculty routinely attend conferences on teaching and learning. They won a number of awards this year at the **ASEE Midwest conference**, including an award to **Dr. Dua's students** for a **Best Undergraduate Poster Award** and to the **students of Dr. Amardeep Kaur and Dr. Steve Watkins** for a **Best Graduate Poster Award** (see pg. 10).
- **The Electromagnetic Compatibility Group** had an exceptional year at the IEEE EMC Symposium, and walked away with the **EMC Society President's Memorial Award**, the **James C. Klouda Memorial Scholarship Award**, the **Best Student Design Award**, the **Best EMC Student Paper Award**, the **Best Paper Award** in Signal and Power Integrity, and the **Best Student Paper Award** in Signal and Power Integrity (see pg. 9).
- **Dr. Jhi-Young Joo**, one of our brand new faculty members, won a **Best Paper Award** at the 2014 IEEE Power and Energy Society General Meeting.
- **Dr. Kimball** won the **Missouri Academic Advisors Association Outstanding Academic Advisor Award** for his outstanding work as a Freshman Advisor, as well as his activities advising student groups, senior design students, and undergraduates in research.
- **Dr. Reza Zoughi** was elected to be the **President of the IEEE Instrumentation and Measurement Society**, one of IEEE's largest groups.
- **Dr. Donald Wunsch** was named a **Master in the DeTao Master's Academy**.
- **The Missouri S&T Outstanding Teaching Award** who have demonstrated a high level of instructional effectiveness as measured by their student evaluations. This year's winners include:
  - **Dr. Theresa Swift**
  - **Dr. Randy Moss**
  - **Dr. Reza Zoughi**
  - **Dr. Joe Stanley**
- A number of faculty who received high student evaluations, but did not teach a sufficient number of courses to win an Outstanding Teaching Award were also commended for their teaching performance. These include:
  - **Dr. Jun Fan**
  - **Dr. Keith Stanek**
  - **Dr. Mehdi Ferdowsi**
  - **Dr. Daryl Beetner**
  - **Dr. Yaojiang Zhang**
  - **Dr. Jaganathan Sarangapani**
  - **Dr. Chengshan Xiao**



- Dr. Chengshan Xiao receiving a congratulations from German Federal President Joachim Gauck in front of his castle in Berlin, Germany, for winning the Humboldt Research award. The right most person is the President of Humboldt Foundation, Professor Helmut Schwarz.

## Yiyu Shi Receives NSF CAREER Award for Computer Engineering Research

Dr. Yiyu Shi, an assistant professor of electrical and computer engineering at Missouri University of Science and Technology, recently received the National Science Foundation's most prestigious award for young faculty members for his computer engineering research that could lead to the commercialization of 3-D integrated circuits.

Shi received the NSF's Faculty Early Career Development CAREER Award. The NSF describes the CAREER Awards as the agency's "most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations."

Shi, a member of the Missouri S&T faculty since 2010, will use the CAREER Award funding to continue his research in the area of advanced circuit design. He has developed a way to reduce the silicon area of a 3-D integrated circuit by up to 30 percent, which could reduce production cost by up to 70 percent.

"A major focus of the electronics industry today is on 3-D integrated circuits or ICs, which stack multiple computer chips vertically and use vertical electrical connections called through-silicon vias, or TSVs, for inter-chip power, heat and signal delivery", Shi says.

"These 3-D ICs are expected to have a smaller area, use less power and perform at a higher speed than their 2-D counterparts," he says. "However, in reality, the TSVs are so big that the benefits cannot be fully attained."

Shi says that past research has focused on minimizing the TSV area, but most efforts have been unsuccessful. Shi addressed the problem from a different angle.

"Instead of making TSVs smaller, I can make them more useful," Shi says. "My preliminary study suggests that a TSV can act as a capacitor, inductor or transistor, and thus its area can be effectively used for many alternative purposes."

Shi says his research will have an impact on both the research community and industry.

"Many big industry players, including IBM and Intel, have contacted me for joint development with my transformative technology," Shi says. "Major support comes from Industrial Technology Research Institute in Taiwan, the leading 3-D IC research laboratory in Asia, which will provide opportunities for silicon validation."

Shi has published more than 20 journal articles, more than 60 conference papers and generated more than \$1.2 million in external research funding during his tenure at Missouri S&T. He has been invited to deliver talks on his current research at universities, research institutes and corporations worldwide.

Shi will receive \$400,000 over three years to continue his research.



## Missouri S&T Students Receive Grainger Power Engineering Awards

Twelve electrical engineering seniors and recent graduates will each receive a \$5,000 Grainger Power Engineering Award from the electrical and computer engineering department at Missouri University of Science and Technology. The awards are presented as a reward for academic excellence.

The Power Engineering Awards are funded by a \$1.3 million endowment from The Grainger Foundation of Chicago. Grainger recognizes Missouri S&T for its ability to attract top students and educate quality engineers and is one of only six universities in the nation chosen to receive such funding.

Each spring, the Grainger Power Engineering Award is typically presented to up to 12 electrical engineering graduate and undergraduate students who plan to pursue careers in power engineering. Selection of recipients is based on academic performance, exhibited interest in power engineering and extra-curricular activities.

To be eligible for this year's award, students must have graduated with degrees in electrical engineering in August or December of 2013 or May 2014, and have a power engineering emphasis in their course work. All recipients had significant power engineering experience, either through company internships, research projects or design projects.

**2014 recipients of the Power Engineering Awards are:**

- **Hollyn Benson** of St. Louis, MO., a May 2014 electrical engineering graduate
- **Vincent Bohl** of Kansas City, MO., a December 2013 electrical engineering graduate
- **Sean Coerver** of Festus, MO., a May 2014 electrical engineering graduate
- **John Conte** of Crystal City, MO., a December 2013 electrical engineering graduate
- **Donald Crites** of St. Louis, MO., a December 2013 electrical engineering graduate
- **Kevin Foflygen** of Springfield, MO., a May 2014 electrical engineering graduate
- **Brooke Greathouse** of DuBois, PA., a May 2014 electrical engineering graduate
- **Stephen Moerer** of Parkville, MO., a May 2014 electrical engineering master of science graduate
- **Clayton Powell** of Sikeston, MO., a May 2014 electrical engineering graduate
- **Kaitlyn Schikore** of St. Charles, MO., a May 2014 electrical and computer engineering graduate
- **Daniel Schrader** of Evansville, IL., a December 2013 electrical engineering graduate
- **Luke Watson** of Albuquerque, NM., a December 2013 electrical engineering Ph.D. graduate.



### Lee Hill Alumni

In January 2014 Lee Hill, received an appointment as a member of adjunct faculty in the Electrical and Computer Engineering (ECE) Department at Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts.



Mr. Hill is teaching a graduate course in electromagnetic compatibility as a part of an MSECE degree program through the Institute's Corporate and Professional Education Department. He completed the first run of the class in November 2014 and will be teaching it again starting Sept. 2015.

### Electrical Engineering Undergrad Wins National Award



Matt Horst, a senior in electrical engineering from Jackson, Missouri, has earned national recognition for his undergraduate work in nondestructive testing.

Horst won an ASNT Engineering Undergraduate Award from the American Society for Nondestructive Testing Inc. The award includes \$3,000 in funding and a framed certificate. News of the award will be published in the August issue of the journal Materials Evaluation.

"Research in nondestructive testing helped me develop critical thinking skills and the ability to work in a team and convey information," Horst says. "On a larger scale, a career in nondestructive testing benefits everybody by advancing technology that monitors the health of structures like buildings and bridges."

The ASNT Engineering Undergraduate Awards are designed to provide a financial incentive for undergraduate engineering students enrolled in ABET-accredited engineering programs to specialize in nondestructive testing. Up to three awards can be given each year.

Dr. Reza Zoughi, the Schlumberger Distinguished Professor of Electrical Engineering at Missouri S&T, is Horst's advisor. Zoughi is director of Missouri S&T's Applied Microwave Nondestructive Testing Laboratory.

### S&T Undergrad Earns IEEE Scholarship



Thomas Roth, a senior in electrical and computer engineering at Missouri University of Science and Technology, received a scholarship award from the Microwave Theory and Techniques Society (MTT-S) of the Institute of Electrical and Electronics Engineers (IEEE).

Roth, of Weatherby Lake, Missouri, is one of 10 students who will receive the \$1,500 MTT-S Undergraduate/Pre-graduate Scholarship for Fall 2014. He will be recognized during the 2015 IEEE MTT-S International Microwave Symposium, held May 16-22,

2015, in Phoenix, Arizona. The award also includes a travel stipend to fund Roth's attendance at the symposium.

The scholarship is designed to attract bachelor's or master's students to the microwave and RF discipline and to encourage them to pursue a job or a Ph.D. in the field.

News of his scholarship will be published in an upcoming issue of the journal Microwave Magazine.

Dr. Reza Zoughi, the Schlumberger Distinguished Professor of Electrical Engineering at Missouri S&T, is Roth's advisor. Zoughi is director of Missouri S&T's Applied Microwave Nondestructive Testing Laboratory.

### IEEE-HKN Chapter Activities

The ECE Gamma Theta Chapter of Eta Kappa Nu (IEEE-HKN) was co-winner in the 2012-2013 Outstanding Chapter Activities Award Program. The Electrical and Computer Engineering Honor Society was one of twenty-three HKN chapters to be recognized. The award is based upon activities that are related to professional development, institutional assistance, scholarship, and public service. Advisors to the group were Drs. Steve E. Watkins, Sahra Sedigh, and Theresa Swift. The chapter has been recognized for the last twelve years in this program.

Keenan Johnson, EE'14, was guest student editor and feature author in the November issue of THE BRIDGE magazine of IEEE-HKN. THE BRIDGE magazine was recognized with a 2014 APEX Award of Excellence in the most improved category of this international competition for communication professionals (www.apexawards.com). Dr. Steve E. Watkins serves as the magazine Editor-in-Chief.

## David Pommerenke Named 2015 IEEE Fellow

Dr. David Pommerenke, professor of electrical and computer engineering at Missouri University of Science and Technology, has been named an IEEE Fellow in recognition of his contributions to system-level electrostatic discharge technology. The honor is the highest grade of membership in the organization.



"To illustrate the research, imagine touching a tablet PC after being electrically charged by walking across a carpet," Pommerenke says. "The small, often barely felt spark may upset or damage the tablet computer."

Pommerenke analyzes situations like this and designs methodology to mitigate the damages.

"While a tablet is a good illustrative example, mitigation of possible damage or upset in medical equipment, automotive safety equipment such as airbags, ABS controllers are direct applications of this research," he says.

The IEEE (formerly known as the Institute of Electrical and Electronics Engineers) confers the grade of fellow upon those with an outstanding record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year cannot exceed one-tenth of 1 percent of the total voting membership.

Pommerenke joined the Missouri S&T faculty in 2001. He is a member of the IEEE Electromagnetic Compatibility Society Technical Committee on Computational Electromagnetics and the IEEE Electromagnetic Compatibility and Dielectrics and Electrical Insulation Society.

His research focuses on electromagnetic compatibility (unwanted coupling between electronic systems), electronics, instrumentation and measurement techniques, electrostatic discharge, and sensors and high-voltage systems. Pommerenke earned his bachelor of science and Ph.D. degrees in electrical engineering from the Technical University Berlin in Germany in 1989 and 1995, respectively.

## Yahong Rosa Zheng Named 2015 IEEE Fellow

Yahong Rosa Zheng, Associate Professor from Missouri University of Science and Technology, Rolla, MO, 65409, USA, has been named an IEEE Fellow. She is being recognized for contributions in wireless fading channel modeling and advanced equalization techniques for wireless communications. These key contributions have significantly impacted recent advances in wireless Multiple-Input Multiple-Output (MIMO) technologies and underwater wireless communications.



The IEEE Grade of Fellow is conferred by the IEEE Board of Directors upon a person with an outstanding record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year cannot exceed one-tenth of one-percent of the total voting membership. IEEE Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement.

Dr. Zheng's contribution in wireless channel modeling has resulted in several channel simulators and emulators that capture the realistic fading channel characteristics and are easy to use, so they have been widely adopted by industry and academia to develop advanced MIMO technologies. Dr. Zheng's contribution to equalization technologies has been successfully applied to MIMO underwater acoustic communication systems which achieved high data rate and reliable reception in hostile environment. Her research contributions are recorded in 48 refereed journal papers and 98 refereed conference papers.

Dr. Zheng received the B.S. degree from the University of Electronic Science and Technology of China, Chengdu, China, in 1987, and the M.S. degree from Tsinghua University, Beijing, China, in 1989, both in electrical engineering. She received the Ph.D. degree from the Department of Systems and Computer Engineering, Carleton University, Ottawa, Canada, in 2002. Dr. Zheng has seven years of industrial experience and over eleven years of academic research experience and IEEE services. She is also the recipient of an NSF (USA National Science Foundation) CAREER award in 2009.

## Sean Bentley Alumni

Dr. Sean Bentley, associate professor of Physics at Adelphi University, will serve as the director of the Society of Physics Students and Sigma Pi Sigma for 2014-15. He received his MS (1997) and BS (1995) in EE from Missouri S&T.

# EMC Awards

The Electromagnetic Compatibility (EMC) group had an outstanding year at the 2014 IEEE international Symposium on Electromagnetic Compatibility. The group is widely regarded to produce some of the best research and best graduates for industry among universities across the world. They reinforced that reputation this summer, when they nearly swept the awards at the Symposium on Electromagnetic Compatibility, the largest and most prestigious conference on EMC of its kind.

### Among the awarded are:

-- **Ketan Shringarpure**, a Ph.D. student in electrical engineering, received the **Electromagnetic Compatibility (EMC) Society President's Memorial Award**. This is the highest award a student in the EMC field can earn.

-- **Benjamin Toby**, a senior in electrical engineering from Kansas City, Missouri, received the **James C. Klouda Memorial Scholarship Award**. The award is presented for outstanding potential for contributions to EMC as an undergraduate electrical engineering student.

-- **Shubhankar Marathe**, and **Giorgi Maghlakelidze**, both graduate students in electrical engineering, received the **Best Student Design Award** for developing a power supply designed to maximize electromagnetic compatibility.

Three papers authored by Missouri S&T faculty, alumni, students and visiting scholars earned Best Student Paper Awards during the symposium.



Photo courtesy of the IEEE EMC Society- Jerry Ramie photographer

### Winning papers were:

-- "*Modeling electromagnetic radiation at high-density PCB/connector interfaces*" won the **Best EMC Student Paper Award**. The paper was co-authored by Xinxin Tian, a visiting scholar with the lab; Dr. Matthew Halligan, who earned bachelor of science, master of science and Ph.D. degrees in electrical engineering from Missouri S&T in 2008, 2010 and 2014, respectively; Xiao Li, who earned a master of science degree in electrical engineering in 2014; Kiyeong Kim, an electrical engineering graduate student from the Korea Advanced Institute of Science and Technology; Hun-g-Chuan Chen, an electrical engineering graduate student from the National Taiwan University; Samuel Connor, of IBM; Bruce Archambeault, adjunct professor of electrical and computer engineering at Missouri S&T; Dr. Michael Cracraft, who earned bachelor



Photo courtesy of the IEEE EMC Society- Jerry Ramie photographer

of science, master of science and Ph.D. degrees in electrical engineering from Missouri S&T in 2000, 2002 and 2007, respectively; Albert Ruehli, an adjunct professor of electrical and computer engineering at Missouri S&T; and Dr. James Drewniak, Curators' Professor of electrical and computer engineering.

-- "*Designing a 3-D printing-based channel emulator*," won the **Best Paper Award** in signal and power integrity. The paper was co-authored by Xiangyang Jiao, a graduate student in electrical engineering; Hui He, a graduate student in electrical engineering; Guanghua Li, a graduate student in electrical engineering; Dr. David Pommerenke, professor of electrical and computer engineering; Wei Qian, a graduate student in



Photo courtesy of the IEEE EMC Society- Jerry Ramie photographer

electrical engineering; Guangyao Shen, a graduate student in electrical engineering; Chong Ding, who earned a master of science degree in electrical engineering from Missouri S&T in 2006; Douglas White, of Cisco Systems; Stephen Scarce, of Cisco Systems; and Yaochao Yang, of Cisco Systems.

-- "*On finding the optimal number of decoupling capacitors by minimizing the equivalent inductance of the PCB PDN*" won the **Best SI/PI Student Paper Award**. The paper was co-authored by Shringarpure; Biyao Zhao, a graduate student in electrical engineering; Leihao Wei, an electrical engineering student from Rose-Hulman Institute of Technology; Archambeault; Ruehli; Cracraft; Matteo Cocchini, who earned a master of science degree in electrical engineering from Missouri S&T in 2008; Edward Wheeler, an adjunct professor of electrical and computer engineering who earned a Ph.D. in electrical engineering from Missouri S&T in 1996; Dr. Jun Fan, associate professor of electrical and computer engineering; and Drewniak.



Photo courtesy of the IEEE EMC Society- Jerry Ramie photographer

## Beetner Named Chair of Electrical and Computer Engineering at S&T



Dr. Daryl Beetner, professor of electrical and computer engineering at Missouri University of Science and Technology, was named chair of the electrical and computer engineering department at Missouri S&T. The appointment took effect Aug. 1.

Beetner took over from Dr. Kelvin Erickson, who served as chair since 2003. Erickson stepped down as chair, but will remain on the faculty as professor of electrical and computer engineering. Beetner was selected following a search led by Dr. Jagannathan Sarangapani, the William A. Rutledge-Emerson Electric Co. Distinguished Professor in Electrical Engineering at Missouri S&T.

Beetner joined the Missouri S&T faculty as an assistant professor of electrical and computer engineering in 1998. In 2004, he was named associate professor. He was named professor in 2010.

"I am motivated to see the department continue to deliver outstanding education, to be a source of leading-edge research, and to be a great place for faculty, staff, and students to work and grow," Beetner says. "Our department is already an example of academic excellence, and has the potential to be even better."

Beetner, who also chairs the University of Missouri Research Board, has brought in nearly \$16 million in sponsored research from the National Science Foundation, industry, the military, national laboratories and the Department of Homeland Security, as well as philanthropic organizations. He helped develop Missouri S&T's Center for Electromagnetic Compatibility, one of the

NSF's most successful Industry and University Cooperative Research Centers.

Most of Beetner's research is focused on electromagnetic compatibility of integrated circuits, but he also works with the detection and neutralization of the electronic devices used in improvised explosives. He has performed research in humanitarian de-mining, detection of skin cancer using the electrical characteristics of the skin and in development of educational materials.

He holds two patents, has authored over 100 publications, two book chapters, and three patent invention disclosures. He teaches a wide variety of courses in both electrical and computer engineering, has developed a graduate-level course and made substantial revisions to labs and undergraduate courses. For the past six years, he has served as an instructor of the CHIPS/Cyberminer Camp, an activity designed to attract high school students to computer engineering.

Beetner has won local, regional and national awards for teaching, research and service, including the Missouri S&T Faculty Excellence Award and the C. Holmes MacDonald Outstanding Young Electrical Engineering Professor Award. He has served in more than 12 officer positions in professional organizations and served as faculty advisor to students in Eta Kappa Nu and the Institute of Electrical and Electronics Engineers (IEEE).

Beetner is a senior member of IEEE and a member of the IEEE Electromagnetic Compatibility Society, and Sigma Xi and Eta Kappa Nu, the Electrical and Computer Engineering Honor Society.

He earned a bachelor of science degree in electrical engineering from Southern Illinois University at Edwardsville in 1990. He earned the master of science and doctor of science degrees in electrical engineering from Washington University in St. Louis in 1994 and 1997, respectively.

## Missouri S&T Represented at the 2014 ASEE Midwest Conference

The 2014 ASEE Midwest Conference was held in Fort Smith, Arkansas September 24-26, 2014. The Missouri S&T attendees were Drs. Rohit Dua, Steve Watkins, Christi Patton Luks, Amardeep Kaur, Stuart Baur, Semih Yildirim, Douglas Carroll, Matt Pierson, and Bob Egbert. Missouri S&T was recognized with the Faculty-Mile Award for attendance at the conference. Dr. Rohit Dua was also recognized as the incoming Section Chair. The following authors from ECE received awards:

**Mason Marshall** and **Benjamin Miller** with Advisor **Rohit Dua** were recognized with the third-place **Outstanding Undergraduate Poster Award** for Poster Paper titled "*Basic Digital Logic Gates Emulator: A Learning Tool for Kids and Adults.*"

**Amardeep Kaur** with Advisors **Steve E. Watkins** and **Hai Xiao** were recognized with the third-place **Outstanding Graduate Student Poster Award** for Poster Paper titled "*Extrinsic Fabry-Perot Interferometer Length Optimization.*"

The ASEE Midwest Section and Missouri S&T will host the 2015 Zone III Conference to be held in Springfield, Missouri on September 23-25, 2015. The Midwest Section of the American Society of Engineering Education (ASEE) includes the states of Missouri, Arkansas, Oklahoma, Kansas, and Nebraska. ASEE Zone III included the Midwest Section, the Gulf Southwest Section, and the North Midwest Section.

## Missouri S&T's Ghasr Named Outstanding Young Engineer

Dr. Mohammad Tayeb Ghasr, assistant research professor in electrical and computer engineering at Missouri University of Science and Technology, was named Young Engineer of the Year by the Institute of Electrical and Electronics Engineers Instrumentation and Measurement Society.

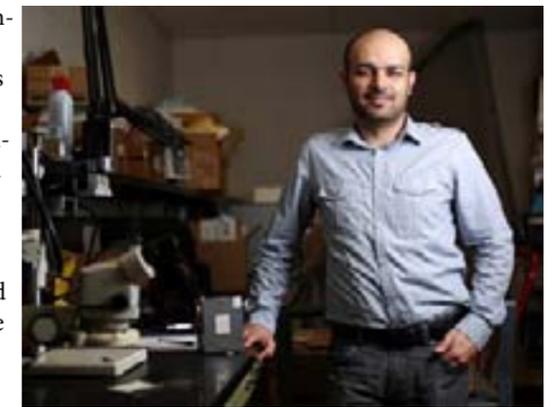
The award, which honors Ghasr for "outstanding contributions to real-time microwave imaging and nondestructive testing systems development," was presented at the 2014 International Instrumentation and Measurement Technology Conference held earlier this summer in Uruguay.

Ghasr, a researcher in the Missouri S&T Applied Microwave Nondestructive Testing Laboratory, holds four U.S. patents. His research focuses on the design and development of microwave and millimeter-wave portable cameras that are capable of producing 3-D images in real time.

"Microwave and millimeter-wave signals easily penetrate inside of non-conductive materials like rubber, fabric, plastics, and fiberglass and interact with their inner structures," Ghasr says. "The ultimate goal is designing portable, battery-operated cameras for use in industry, aerospace, security and biomedical applications."

Ghasr's current project is to design and build a real-time 3-D imaging device that operates at millimeter-wave frequencies and is capable of providing video and still imaging of the interior structures of various objects.

"Such a device can be used for security screening purposes to examine bags and backpacks carried into a sporting venue," Ghasr says.



## Controls Laboratory Enhancements

The equipment in the ECE controls laboratories are being enhanced through a combination of university and external gifts. The campus provided about \$70,000 and about \$90,000 was obtained through external gifts from Anheuser-Busch, Automation and Control Concepts, ArcelorMittal, Burns and McDonnell, CPM Beta Raven, the ECE Academy, Intelligrated, McEnergy Automation, Nucor-Yamato Steel, Siemens, and Dr. Keith Stanek. The equipment supports a new required controls laboratory course and a new course in motion control. This equipment will also support the laboratories at the cooperative program with Missouri State University in Springfield.

Effective with freshman entering in Fall 2014, the currently required two linear systems courses (plus laboratories) for electrical engineering students are being replaced by a required controls course and a required communication course, both with new laboratories. The new controls laboratory course, EE 3321, will accompany the revised control systems course, now numbered EE 3320. For EE 3321, the new equipment will provide a real-world system to augment the theory learned in the lecture. Specifically, the students will perform exercises to determine the transfer-function model of a DC servo motor or level process and then use that information to design a PI/PID controller and a lead/lag controller and then implement that control and test its performance to control the DC motor speed or level. As part of the course, the students will also learn MATLAB and Labview.

In addition, companies that hire our graduates for automation engineering positions have requested that graduates be familiar with motion control in factory automation. For the new motion control course, the equipment will support the following laboratory exercises:

- Simple motion control
- Coordinated control of two axes and three axes (for example, draw letter or shape)
- Flying shear (cut material to length while it is moving)
- Web tension control.

Both the new controls lab and the new motion controls course are being taught on an experimental basis in the Spring 2015 semester.



Siemens Simple Motion Control (guards have been removed)



Quanser QUBE-Servo (from Quanser, Inc.)

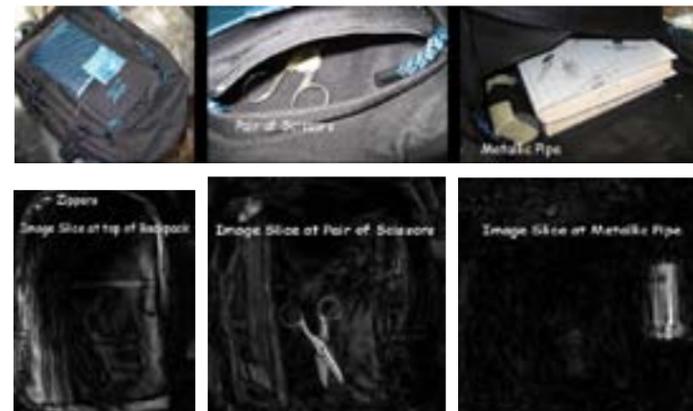


Tension Control Equipment (guards have been removed)

## Microwave Camera System

Researchers at Missouri University of Science and Technology (S&T) have been actively developing critical building blocks of a real-time, 3D, millimeter wave imaging system for use in a myriad of applications. Signals at millimeter wave frequencies (30-300 GHz) penetrate through optically opaque and electrically non-conducting materials (e.g., clothing, walls and bags) and their interaction with objects in the interior of these materials can be detected and transformed into high-resolution images. However, for such imaging systems to be of practical use in high throughput environments, (i.e., airports, emergency situations), they must produce real-time, non-contact and high-resolution images, while being readily portable and require little to no special skills to operate them. In other words, it must operate similar to a handheld video camera with the additional capability of “seeing through” articles of clothing and producing images of objects that are readily recognizable (i.e., handguns, knives, etc.) – in 3D.

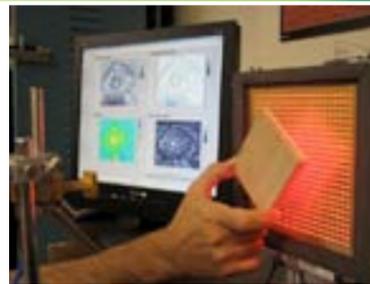
A prototype microwave camera system (as shown) was designed and constructed to demonstrate the fact that such imaging systems can be designed to be real-time (producing ~30



The microwave camera developed by the Applied Microwave Non-destructive labortary, clearly shows, these items hidden in a backpack

images per second), portable, battery-operated and high-resolution. In 2010 U.S. Patent number 7,746,266 was issued for this system (also issued in Japan, No. 5,070,357, and pending in Europe). A short video demonstrating the operations of this camera may be found at Missouri S&T YouTube channel (<https://www.youtube.com/watch?v=PeS2SFNb6dY&list=PL0E03A6DBC3B5C1A2>). More information on the development of a host of imaging systems may also be found at <http://youtu.be/ytWxFlexH7Y>.

A recent new design paradigm shift has resulted in a significant leap forward towards this objective. Missouri S&T has filed for a patent for this novel method which is currently pending. The following pictures and corresponding slices of millimeter wave images of a backpack, with objects in its different compartments, clearly and unequivocally demonstrates this technical advancement and its awesome potential capabilities for all (and more) applications previously mentioned.



A student holds an object in front of the real-time microwave camera.

## Researchers Study ‘Smart’ Rocks use for Detecting Bridge Damage

It’s hard to gauge how structurally sound a bridge is when its foundation is buried in a riverbed deep below the water’s surface. New “smart” rocks that are being developed by researchers at Missouri University of Science and Technology will give engineers an accurate, easy and cost-effective tool to monitor a bridge’s foundation, in real time.

Smart rocks placed at the base of bridge foundations are designed to roll to the deepest point of a scour hole and act as field agents to relay scour depths.

“It’s a simple, but very useful, concept,” says Dr. Genda Chen, principle investigator and professor of civil, architectural and environmental engineering and the Robert W. Abnett Distinguished Chair in Civil Engineering at Missouri S&T. “The rock follows the trail of the scour hole’s progression – as it goes deeper and deeper, the rock will also sink deeper and deeper. One reason we call it ‘smart’ is because the rock can represent the maximum depth of the hole.”

Chen is collaborating on the project with Dr. David Pommerenke, professor of electrical and computer engineering, and Dr. Rosa Zheng, associate professor of electrical and computer engineering. The project is sponsored by the Research and Innovative Technology Administration of the U.S. Department of Transportation and the Missouri Department of Transportation.

The researchers are testing three smart rock technologies: passive, active and semi-active. Passive smart rocks have an embedded magnet that can be read by a remote magnetometer. Active smart rocks have embedded electronics, including a pressure sensor, gyroscope, timer, battery indicator and individual identification, which transmit data through wireless communication. Semi-active smart rocks include a free-to-rotate magnet that can be controlled with electronic circuitry.

Chen says during normal operations, readings are usually taken every six months to a year. “But scour develops very rapidly during flood season,” he says. “If the engineer feels like there might be a new development, they can take a reading at that moment, without being overwhelmed with continual data processing and storage.”

The researchers hope to partner with state departments of transportation for further studies.



## Keenan Johnson, SpaceX Man



As a freshman, Keenan Johnson conducted experiments in near-zero gravity aboard NASA’s “weightless wonder” aircraft as part of Missouri S&T’s Miners In Space Team.

Soon, he will be writing computer software that will send other vessels into space and ultimately to launch a mission to Mars.

Johnson, who graduates in December with a bachelor’s degree in computer engineering, will start working for space exploration company SpaceX in February. He’s already worked at the Hawthorne, California company twice – first on a co-op assignment from January through August 2013 and then on an internship last summer. In both cases, he was part of the team that writes code to launch

rockets into orbit. In February, he’ll rejoin that team as a full-time employee.

“My team writes all the software responsible for launching and operating the spacecraft,” he says. “It’s pretty exciting because the stakes are high for rocket launches. There’s not a lot of margin for error.”

It’s the excitement of working on the edge of space exploration that inspires Johnson. “The work environment is super dynamic and everything happens very quickly,” he says. “Everyone there is very passionate about what they’re doing.”

Johnson didn’t always envision a career in space exploration. The Jefferson City, Missouri, native wasn’t sure what he wanted to do when he enrolled at Missouri S&T. But after he joined Miners in Space as a freshman, “that taught me that this was possible,” he says. “In high school I never thought I’d be able to do anything like this.”

On his co-op and internship, Johnson developed software used to monitor and control the Falcon 9 rocket and the Dragon spacecraft. The experience “taught me how awesome it is to work on technology that is changing the world.”

Earlier this fall, SpaceX and Boeing both won NASA contracts to transport astronauts to the International Space Station. It’s an ambitious project, but to Johnson, it’s only a small step to a far greater leap.

“I hope to change the world,” he says. “I want to make humanity a space civilization. I want to do the things that will allow future generations to explore the cosmos and increase the quality of life here on Earth.”

## S&T Computer Engineer Patents Quantum Computing Device

While widespread quantum computing may still be 15 years away, a computer engineering professor at Missouri University of Science and Technology has patented a quantum processor capable of parallel computing that uses no transistors.

Dr. C.H. Wu, professor of electrical and computer engineering at Missouri S&T, patented the device and will speak about the research behind the patent at the American Physical Society March Meeting 2014 in Denver on Monday, March 3. His research will also be published in an upcoming issue of the journal Cellular Automata. Wu’s work on the subject was also published in a 2011 issue of the Journal of Applied Physics.

Wu believes his device could replace current electronic computing systems, but it could also provide quantum computing capabilities.

Traditional computers use a series of transistors as a type of “logic gate” to perform computing tasks. The transistors perform a logical operation on one or more logical inputs to produce a single logical output. Wu’s quantum processor replaces 24 transistors, using symbolic substitution rules instead of logic gates.

Wu believes that if you wire several of his patented devices together correctly, it will form a cellular automaton capable of performing computation without the use of transistors required in current computing systems. This will allow for much smaller processor chips and great increases in processing speed.

A cellular automaton is a series of colored cells on a grid that evolve through a set of steps based on the properties of each neighboring cell. Wu says his processor is rule-based and can distinguish left and right in spatial relations on such grids – something logic gates, which are based on truth tables, cannot.

“Cellular automata architecture has been proposed as the most promising parallel computing scheme for the last six decades,” Wu says. “Unfortunately, most scientists have been looking at the wrong size of cell needed for computing.”

Wu says it is commonly believed that cellular automata must be long strings of single cells, but he says that current prototypes are unstable. Wu’s device uses two data bits per cell. When wired together properly, it is stable in simulation.

“Even if some scientists had looked for cellular automata with the correct two-bit-per-cell size, the search for the correct set of rules for computing is like finding a needle in a haystack because there are more than a billion possible sets of rules and only one of them works for computing,” Wu says.



# Seven Inducted into S&T Academy of Electrical and Computer Engineering

Seven electrical and computer engineers with ties to Missouri University of Science and Technology were inducted into the Missouri S&T Academy of Electrical and Computer Engineers during the academy's induction ceremony, which was held at the Comfort Suites Conference Center in Rolla, Mo., on April 24, 2014. The academy is an advisory group to the Missouri S&T electrical and computer engineering department. Founded in 1980, the academy is composed of alumni and other electrical and computer engineers who have made outstanding contributions to their profession.

## New members are listed below:

- **Michael J. Basler** of Highland, IL, engineering manager of Basler Electric Co., earned a bachelor of science and master of science degrees in electrical engineering from Missouri S&T in 1979 and 1989. Basler began his career as an electrical engineer for the Emerson Electrical Co. in 1979, and later Basler Electrical Co., where he held various design engineering and engineering management positions from 1981 to 1986.

- **Chris W. Bolick** of Rogersville, MO., manager of administrative services for Show-Me Power Electric Co., earned a bachelor of science degree in electrical engineering from Missouri S&T in 1986 and later began his career as a planning engineer with Associated Electric Co. He also does mission work in Nicaragua and Mexico and helped build three schools and churches in Honduras.

- **Christopher L. Hamon** of Branson, MO., chief executive officer of White River Valley Electric Cooperative Inc., earned a bachelor of science degree in electrical engineering from Missouri S&T in 1984, and began work in White River Valley Electric Cooperative Inc. as a planning engineer. He serves on the board of directors of the National Rural Utilities and Cooperative Finance Corp., Show-Me Power Electric Cooperative and the Branson Chamber of Commerce.

- **Theodore J. "Ted" Hilmes** of Claremore, OK., chief operating officer for KAMO Power, earned a bachelor of science degree in electrical engineering from Missouri S&T in 1992, and began his career as a planning engineer with Associate Electric Cooperative Inc., and later served as manager of engineering for Southern Illinois Power Cooperative Inc until 2001. Hilmes is a member of Institution of Electrical and Electronics Engineers (IEEE), Eta Kappa Nu, and Tau Beta Pi.

- **Michael T. Lemanski** of St. Louis, MO., an electrical engineer with The Boeing Co., earned a Ph.D. in electrical engineering in 2002 and a master of science degree in engineering management in 2008, both from Missouri S&T. He began his career as an electronics engineer with Marsh Co., and joined Boeing in 1995. He also volunteers with FIRST Robotics.

- **Lester C. Roth** of Fairfax Station, VA., an analyst with Group W Inc., earned bachelor of science and master of science degrees in electrical engineering from Missouri S&T in 1969 and 1978, respectively. From 1969 to 1989, he served in the U.S. Army Corps of Engineers, training in Airborne, Ranger, physiological operations and operational research, and serving in Fort Bragg, N.C., Okinawa, Korea and Germany.

- **Edward J. Wooldridge** of Farmington, MO., technical fellow for The Boeing Co., earned bachelor of science, master of science and Ph.D. degrees in electrical engineering from Missouri S&T in 1981, 1983 and 1991, respectively, and began his career with McDonnell Douglas in 1979 as part of the cooperative education program. Wooldridge is also a foreign technology consultant for the National Air and Space Intelligence Center, and he presented the fourth Joint Nato International Military Sensing Symposium in Paris.

## Steve Watkins Elected to ASEE Position

Dr. Steve E. Watkins, professor of electrical and computer engineering at Missouri University of Science and Technology, has been elected chair of Zone III of the American Society of Engineering Education (ASEE). He will serve as chair-elect for 2014-15 and as chair for 2015-17.

Watkins will be asked to identify initiatives to support and strengthen ASEE section meetings and promote zone meetings. He will also coordinate communication among sections to share good practices in regard to student chapter involvement, student paper competitions and industry-government partnerships.

Watkins, who also serves as associate chair of electrical engineering undergraduate studies at Missouri S&T, earned bachelor of science and master of science degrees in electrical engineering from Missouri S&T in 1983 and 1985, respectively. He also holds a Ph.D. in electrical engineering from the University of Texas at Austin.

Watkins is a senior member of the Institute of Electrical and Electronics Engineers and SPIE – the International Society for Optical Engineering and is a member of the American Society for Engineering Education, Eta Kappa Nu, Tau Beta Pi and Sigma Xi. He holds one patent and has authored three book chapters, 48 archival papers and 79 other publications.

He will begin his term of office with ASEE on July 1.



# Cooperative Engineering Program in Springfield

The Cooperative Engineering Program is an effort between Missouri S&T and Missouri State University to offer engineering programs in Springfield, Missouri. Planning for the program started in 2004 when the Springfield business community approached Missouri State University and formally requested that an engineering program be established in Springfield. A focus group was established in 2005 and it was concluded that there was a strong need for Civil and Electrical Engineering programs in the Springfield area. The state legislature passed Senate Bill 98 in 2005 which established the engineering program as a cooperative effort between Missouri S&T and Missouri State University, and the bill was signed into law by Governor Matt Blunt. The bill provided start-up and recurring funds to support the program, divided evenly between the two universities.

In 2006, UM System President Elson Floyd, Missouri S&T Chancellor Jack Carney, and Missouri State University President Mike Nietzel signed a memorandum of agreement establishing the basic framework for the delivery of the engineering programs in Springfield. The Coordinating Board of Higher Education approved the program in early 2007. The first students were accepted into the program in Fall 2008 and the first students graduated from the program in Spring 2012. The program was officially accredited by ABET in August 2012. All graduates of the program received an ABET accredited engineering degree.

Graduates of the program receive their engineering degree from Missouri S&T. The students enroll in non-engineering courses including calculus, physics, chemistry, English, history, economics, etc. that are offered by Missouri State and enroll in engineering courses offered by Missouri S&T. Students are admitted to both universities. They register for MSU courses and Missouri S&T courses through the respective university systems. When the program began in 2008, nineteen students enrolled, planning to study Electrical Engineering. Enrollment has been growing since that time and currently stands at 108. Eight students received their Electrical Engineering degree 2012, 11 in 2013, and 4 in 2014.

In Fall 2008, the program was housed in a building that was shared with Physics and Construction Management programs. In the summer of 2013, Missouri State University completed the renovation of the Plaster Center for Free Enterprise, and the program was moved to the new facility. The new facility has two electrical engineering labs, two distance education classrooms, two regular

classrooms, a computer lab, an office complex, and numerous places for students study and socialize. The program in Springfield is integrated with the program in Rolla. Great effort has been made to ensure that students in Springfield receive the same educational experience and same quality of education as the students in Rolla. Admission standards are the same for all students. Faculty in Rolla teach many of the Electrical Engineering courses offered in Springfield using distance education. Robotics equipment for some courses is located in Rolla, but students can do the programming in Springfield and then upload the software to the equipment in Rolla to troubleshoot and work through the lab experiments. High quality video, camera feeds and sound systems allow the students in Springfield to interface effectively with the lab in Rolla. There are three Electrical Engineering faculty in Springfield. These faculty members offer distance classes for students in Rolla, as well as teaching classes for the students in Springfield.

The Cooperative Engineering program has proven to be a great success. Providing electrical engineers for southwest Missouri was one of the primary goals in establishing this program. A total of 24 Electrical Engineering students have graduated from the program and the graduates have been very successful in procuring employment after graduation. Most of the graduates have stayed in southwest Missouri. The Cooperative Engineering program has benefited both the graduating students and southwest Missouri.



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