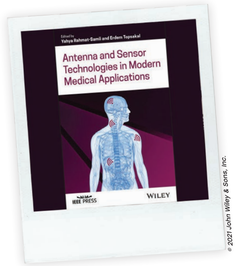
NEWS/RESEARCH



New textbook on medical antennas and sensors

Erdem Topsakal, Ph.D., is co-editor of "Antenna and Sensor Technologies in Modern Medical Applications," a new textbook published by Wiley. Topsakal's collaborator on this book is **Yahya Rahmat-Samii, Ph.D., N.A.E.**

GROWTH

NOW OPEN:
the Engineering Research Building

VCU Engineering held a different kind of grand opening for its new Engineering Research Building. To comply with restrictions because of the COVID-19 pandemic, a large audience of well-wishers gathered by Zoom Feb. 3 to see university officials, architects, builders and civic leaders cut the ribbon on the 133,000-square-foot research and workforce development hub.

The building facilitates expanded public-private partnerships in VCU Engineering research. Construction of the $93 million facility was funded by taxable bonds, which allows VCU Engineering to work closely with industry to conduct translational research. These collaborations support the college's mission to train students in real-world engineering, often alongside industry professionals. The Engineering Research Building also includes a 9,000-square-foot makerspace and a fully wired courtyard for working outdoors.

FROM THE CHAIR

Erdem Topsakal, Ph.D.

Professor and Chair
Department of Electrical and Computer Engineering

VCU's Department of Electrical and Computer Engineering is advancing research, education and sophisticated technologies that build communities and enhance quality of life.

Our faculty and students are passionate about inventing new devices and systems that improve health, homes, communication, transportation and cities. We're commercializing these technologies, too. In fact, a student-run startup based in our department developed a facemask that uses heat in an attempt to create a hostile environment for microorganisms and viruses like COVID-19.

As leader of the Central Virginia node of the Commonwealth Cyber Initiative, we're driving research that will make Virginia a national and global leader in cybersecurity and cyber physical systems.

Our department's nationally recognized faculty, impressive students and family atmosphere make us proud, and add value to the discipline.

44
ACTIVE RESEARCH GRANTS IN 2020-21

38
INVENTION DISCLOSURES SINCE 2018

AREAS OF RESEARCH

Micro-/nano-electronics and photonics
Power, energy and controls
Signal processing and communications
Computer architecture and cyber physical systems

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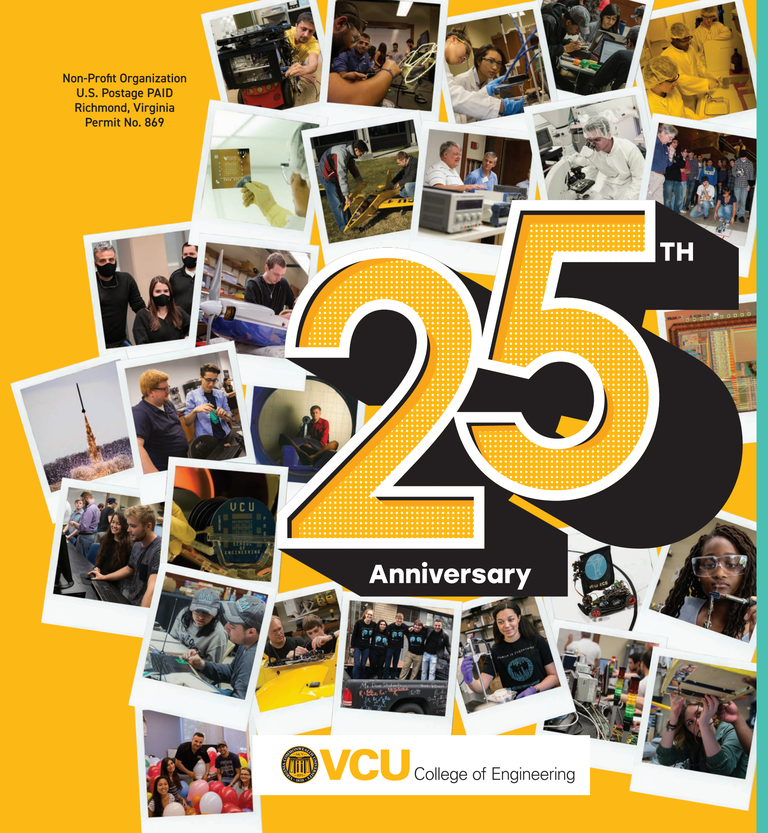


2020 - 2021 Annual Review
VCUEngineering
Engineers Make It Real.
Electrical & Computer Engineering

Professor honored by USAID, the National Academies and IEEE

The United States Agency for International Development (USAID) and the National Academies of Science, Engineering and Medicine named **Supriyo Bandyopadhyay, Ph.D.**, a Jefferson Science Fellow for 2020-21. The Jefferson Science Fellowship Program appoints leading researchers as advisers in the rapidly advancing science, technology, engineering and medical areas that impact U.S. foreign policy decisions.

Bandyopadhyay also received the 2020 IEEE Nanotechnology Pioneer Award. He is known internationally as a pioneer of spintronics, an emerging technology that uses an electron's spin to store, process and communicate information, as well as straintronics, an extremely energy-efficient nanomagnetic process that uses mechanically applied strain to manipulate magnetic states. In 2021, he was also honored with the Albert Nelson Marquis Lifetime Achievement Award by Marquis' Who's Who.

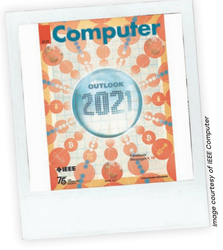


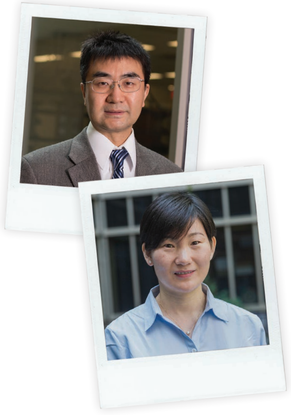
Image courtesy of IEEE Computer

Fixing complex faults in embedded systems

Work by **Carl Elks, Ph.D., Smitha Gautham, Ph.D. (Ph.D.,'20)** and **Athira Varma Jayakumar (M.S.,'20)** made the cover of IEEE Computer. Their article explains the difficulty of detecting software anomalies in embedded systems. The authors concluded that Embedded Trace (common on microprocessors) and runtime verification technology may be the answer to detecting these faults. The team characterized the effectiveness of various debugging protocols, and offered a case study on a VCU Smart-Sensor testbed.

NEWS/RESEARCH

5G communications system for smart warehouses



Ruixin Niu, Ph.D., is working to optimize communications systems for smart warehouses. He is the principal investigator on a project to design a distributed wireless system to enhance communications capabilities for smart warehouses' industrial internet of things devices. VCU's team, including Niu and **Yanxiao Zhao, Ph.D.**, is developing this technology with a $500,000 subaward from the Virginia Tech Applied Research Corporation for a 5G smart warehouse project funded by the U.S. Department of Defense.

Using data to fight food deserts

Sherif Abdelwahed, Ph.D., is leading a team that received a one-year pilot grant from the National Science Foundation to improve access to high-quality food throughout the Richmond region. The project uses sensor technologies, data analytics and community engagement to identify food deserts where fresh, nutritious food is in short supply. Designing systems to monitor localities' access to quality food will result in research data that will help elected leaders and nonprofits allocate resources more effectively.

STUDENTS/ALUMNI

Abeed receives Distinguished Dissertation Award

Photo courtesy of Md Ahsanul Abeed, Ph.D.

Md Ahsanul Abeed, Ph.D. (Ph.D.'20), received VCU's 2020 Distinguished Dissertation Award. His adviser was **Supriyo Bandyopadhyay, Ph.D.** Abeed investigated a method that uses nanoscale magnets for information processing. The main focus of his research was straintronics, in which nanoscale magnetic structures are altered by electrically generated mechanical strain. He applied strain-switched nanomagnets to many information processing tasks and presented modeling and experimental work demonstrating efficiency gains. Abeed is now with Micron Technology Inc., working in its U.S. research and development headquarters in Boise, Idaho.

Photo courtesy of Ashley Lawrence

Class of 2020: Meet Ashley Lawrence

When she graduated from high school in 2009, college seemed like an impossibility for **Ashley Lawrence (B.S.'20)**. She supported herself as a dog groomer, eventually enrolling in community college. When she took an engineering class to fill an elective requirement, her passion was ignited. Upon arrival at VCU Engineering, she embarked on an endeavor – the Life and Automatic Response Emergency System – that later became her Capstone Design project. She is now the first woman engineer to work in Proseal America's control systems department.

– Leila Ugincius, University Public Affairs

STUDENTS/ALUMNI

Student profile:

Meet Nadajah Knight

A Type 1 diabetes diagnosis in 2012 has fueled senior **Nadajah Knight's** passion to help innovate new medicines and medical devices for people with chronic illnesses. As an electrical engineering student with a focus on bioinstrumentation, Knight has participated on three research teams. Among the devices she has helped fabricate and test are an implantable glucose sensing system and a sensor that can measure glucose and ascorbic acid simultaneously. She is also active in the National Society of Black Engineers, Society of Women Engineers and the Louis Stokes Alliance for Minority Participation.

Innovation Spotlight:

TekStyle

TekStyle, a startup run by students at VCU Engineering, is designing a new face mask that protects the wearer in two ways. In addition to forming a physical barrier against airborne pathogens, TekStyle's "Celsius" mask uses heat in an attempt to create a hostile environment for microorganisms and viruses like COVID-19.

Photo courtesy of TekStyle

Flag redesign selected as finalist

When the Mississippi legislature decided to remove Confederate imagery from its state flag, a design for a new flag by **Ryan Green, Ph.D. (Ph.D.'19)**, was one of five finalists selected from a pool of nearly 3,000 submissions. A multi-generation Mississippian who came to VCU to study with Erdem Topsakal, Ph.D., Green is now an assistant professor at Mississippi State University, where he was recently awarded a 2021 Outstanding Teaching Award.