Electric *potential*

NEWS YOU CAN USE ABOUT THE ELECTRICAL AND COMPUTER ENGINEERING MAJORS AT THE US NAVAL ACADEMY.

Computer engineers often find themselves focusing on problems or challenges that result in new "state of the art" products that integrate computer capabilities.

New Computer Engineering Major for Class of 2011

USNA is proud to offer, for the first time, a degree in **Computer Engineering**, a discipline that combines fundamentals from both electrical engineering and computer science. Computer engineers understand the many different aspects of a computer, ranging from low-level physics to high-level computer software. Because computer engineers understand the "under the hood" operations of a computer, they often become more adept at programming than their computer science counterparts. Computer engineering majors at USNA are grounded in electrical engineering and will have the opportunity to gain experience in many sub-disciplines including algorithms, computer architecture and organization, computer systems engineering, digital logic, electronics, embedded systems, operating systems, programming fundamentals, software engineering, VLSI design and computer networking. We are in the midst of the "digital age", and as a computer engineering student, you will learn how the discovery of the transistor sparked an unprecedented growth in digital processors, creating an extraordinary need for computer engineers. Digital processors are everywhere, including PCs, laptops, cell phones, PDAs, iPods, Playstations,

Tivos, the backbone of the internet, etc. Imagine yourself with being able to understand the intricacies of the internet, with the knowledge of what really happens when you send an email, the ability to design processors like the Pentium, the ability to distinguish the real difference in capabilities between a Sony Playstation and a Nintendo Wii, and most importantly with the ability to contribute to society inside and outside the military with your knowledge in an exciting, dynamic digital world…. *Imagine!*
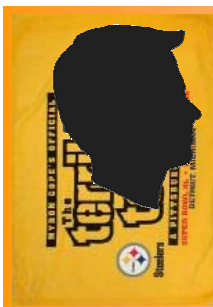
FACULTY PROFILE

The new Computer Engineering (CE) degree brings the arrival of new faculty members. Assistant Professor Ryan Rakvic joined us in 2005. Prior to USNA, he spent 5 years in the computer research lab at Intel Corporation in Santa Clara, CA. He comes with CE degrees from the University of Michigan (B.S.) and Carnegie Mellon University (M.S. and Ph.D.). He has since taught classes in Digital Logic, Embedded Systems and Microcomputer Interfacing. He enjoys teaching and believes "everyone here has the capability to become a successful computer engineer". During his time at Intel, he invented creative ways to increase the performance of Pentium microprocessors. More recently, his research focus has been attempting to use the emerging efficiency of Field Programmable Gate Arrays (FPGAs) to outperform a general purpose microprocessor both in terms of performance and power efficiency.

ECE Gets All Electric GEM Car for Projects

The Electrical and Computer Engineering department recently acquired a Chrysler Global Electric Motorcar (GEM) to support senior design projects and to illustrate electric-drive technologies. The vehicle is "all electric," meaning no internal combustion engine, no emissions, and no stops at the local gas station! The GEM car has a governed top speed of 25MPH, with a range of about 30 miles per battery charge. OK, not quite the specs of the $100k electric Tesla Roadster which accelerates 0-60mph in 4 seconds, with a top speed of 135mph, but legal enough for cruising the Academy Yard! The vehicle contains a 72-volt source (six 12-volt lead acid batteries) that energizes a 5-horsepower DC motor via a power electronic converter. The motor feeds a differential which in turn drives the front two wheels. The motor-drive is 80-90% efficient, as compared to about 25% for a gas engine. The battery is recharged from any standard 110VAC outlet and takes approximately 6-8 hours to completely recharge.

The 1170-pound model GEM eS has a 39" by 48" flatbed which is ideal to mount mobile senior design projects (like a IED detection system or an electric paint-ball gun) or to transport cool refreshments to the annual EE picnic at the end of the spring semester! This year, students are working to design a remote starting system as well as incorporating biometric security measures. Another student is developing a custom battery charging system that might be used to accommodate alternative battery technologies such as Lithium-Ion or Nickel-Metal-Hydride. Future projects might involve integrating additional sensors, visual displays, cameras, solar panels and any other ideas that you might conjure up! You can find the EE GEM car in the hallway of the lab-deck of Rickover Hall. Stop by and check it out!

MORE ECE INFO:
www.usna.edu/EE

CDR McCue, USN
Assoc Chair
mccue@usna.edu
3-6152

Associate Professor
Samara Firebaugh
firebaug@usna.edu
3-6175

USNA Students Help in Counter IED Fight

Improvised Explosive Devices have been the weapon of choice for insurgents in Afghanistan and Iraq. The Joint IED Defeat Organization (JIEDDO) was formed in 2006 to lead the US efforts to counter this threat. More than 81,000 IED attacks have occurred in Iraq since military operations began in 2003 with 25,000 attacks happening in 2007 alone. Currently, IEDs can be placed in a wide variety of locations, which makes detecting and defeating them extremely challenging.

The U.S. Naval Academy, sponsored by JIEDDO, has joined the fight against IEDs. USNA is part of the technical gaming team which plays adversary roles as a red team cell. Students are challenged to create IEDs after a briefing by the Marine Corps Warfighting Lab on insurgency tactics and devices found in theater. Students are uniquely positioned to challenge the typical research organization's norms and established thinking. One of the goals is to challenge emerging operational concepts to discover our own weaknesses before our adversaries do. In addition, we play a blue cell role, attempting to devise new ways to detect the threat. Students have built a robot platform which holds student designed projects for detection and communications.

The "Hockey Puck" Sensor Network

The goal of this senior design project is to develop and implement a robust, reliable, delay & disruption tolerant wireless sensor network that can relay sensor data to a more distant command and control station, Unmanned Aerial Vehicle (UAV), or ground troop that is beyond the range of any individual node. Sensors will be approximately the size of a hockey puck, communicate using the ZigBee® wireless standard, and dispersed throughout a coverage area.

In order to operate in such harsh environments, the sensor network utilizes a dynamic message routing scheme which will allow it to overcome problems with lost or destroyed sensors, as well as easily incorporate replacement sensors. Similarly, transmission on multiple frequencies will allow the network to operate even in the presence of hostile interference or jamming.

The resilient nature of this network will provide a means to help counter the ongoing threat of IEDs to the United States Armed Forces. Furthermore, such a network could incorporate position location and tracking for inventory and personnel, health and status monitoring of equipment in hazardous locations, and provide covert communication between personnel in the coverage area.