



The George Washington University
Virginia Science & Technology Campus

7TH ANNUAL SCIENCE, TECHNOLOGY, ENGINEERING DAY

Thursday, April 11, 2013
9 a.m. to 3:30 p.m.

- Car Crashes & Injuries
- Greater than the Sum of its Parts: Integrating a Robotic System
- Herbal Medicinal Compounding
- Pharmacogenomics... The Key to Personalized Medicine
- Quadrotor Dynamics and Flight
- Securing Your Digital World
- Technology and the World of Nursing
- The Flight of a Ping Pong Ball
- The Science of Accident Investigation
- When the Earth Moves: Designing Resistance to Earthquakes
- Transportation Engineering and the Human Factor

The event is designed for Loudoun County Public School students in grades ten through twelve. Enrollment is limited. Online registration is coordinated by the science teachers in each high school.

REGISTRATION DEADLINE

Tuesday, April 2, 2013



2013 WORKSHOP DESCRIPTIONS

Car Crashes & Injuries: How Accident Analyses and Computer Simulation is Used to Design Safer Cars

*School of Engineering and Applied Science,
Dept. of Civil and Environmental Engineering*

Gain an understanding of vehicular crash safety and the multi-disciplinary fields needed to address this rising problem. Learn how to analyze accident reports to discover typical injuries in head-on or side impact crashes in cars. Review crash tests that simulate common crash scenarios and learn how computer simulations can be used as a tool to study occupant kinematics and assess injuries. You will work in teams to study a set of accident reports, and then assess how crash injuries and occupant behavior occur. You will be challenged to determine the causes for the accidents. The teams will propose safety features that could be implemented into the design of new cars. You will then propose new test conditions that could be implemented in new safety standards based on your own analyses!

Greater than the Sum of its Parts: Integrating a Robotic System

*School of Engineering and Applied Science,
Dept. of Mechanical & Aerospace Engineering*

As the boundaries between technical disciplines continue to blur, scientists and engineers are increasingly relied upon to look outside their specialties into other fields for inspiration and assistance in solving problems. Robotics has long been at the forefront of this trend, integrating mechanical, electrical and computer systems for various purposes. In recent years, the field has further evolved, looking to biological systems for novel system designs, from analyzing how a cockroach crawls over obstacles twice its height to mimicking the way in which an octopus is able to continuously deform its arms to wrap around and grasp objects of varying size and shape. In this workshop, you'll learn how mechanical and electrical components are integrated with software through a controller to operate robots in real-time. You will also learn how to interface different types of sensors and actuators to a tiny computer board known as a microcontroller, how to program it and how to build a mobile robot capable of following curved lines and avoiding obstacles.

Herbal Medicinal Compounding

*Shenandoah University,
Bernard J. Dunn School of Pharmacy*

For over 5,000 years herbs and other natural products have been principal sources of pharmacologically active compounds. Current prescription based treatments for diabetes, cardiovascular disease, and cancer find their origins in plants such as galega ("goat's rue"), willow bark, and the bark of the Pacific yew tree. For some patients however, because of their age, allergies or failure of a standard treatment, physicians need to prescribe a compound medication which is customized to an individual person—or animal's—needs. In this interactive lab experience, learn about and experiment with medicinal plant compounding. Discover how household items and plants from your garden are commonly used to create topical medicinal therapies for wound healing, pain relief, bacteria control and skin regeneration.

Pharmacogenomics... The Key to Personalized Medicine

*George Washington University, School of Medicine
and Health Sciences and Shenandoah University,
Bernard J. Dunn School of Pharmacy*

Pharmacogenomics is the future of personalized health care, enabling physicians to tailor a medication therapy to the needs of an individual based on their specific genetic makeup. You will gain hands-on experience manipulating and analyzing DNA and learn basic techniques used in DNA fingerprinting, sequencing and genetic analysis. Work with real data from actual patient studies demonstrating how genetics determines an individual's response to medication, and how the same genetic techniques shown on popular TV shows such as CSI are being used in the medical field to improve patient care. This workshop is highly recommended for students interested in pursuing a career in the biological sciences, medicine, or pharmacy.



2013 WORKSHOP DESCRIPTIONS

Quadrotor Dynamics and Flight

*School of Engineering and Applied Science,
Dept. of Mechanical and Aerospace Engineering*

Unmanned Aerial Vehicles (UAVs) have a wide variety of applications including drone flights in the military, assisting in civilian search and rescue, and aerial mapping and surveillance. Quadrotors, a newer type of micro-air vehicle, are pushing the boundaries in multi-craft communication, environmental exploration and maneuverability. In this workshop witness a quadrotor in action and learn the unique dynamics required for its control systems. You will test your own control strategies on an inverted pendulum and then maneuver the quadrotor over a given trajectory and test its response rate. Now think how would you control multiple quadrotors and fly them over various terrains with unpredictable conditions? Learn firsthand how scientists are improving multi-vehicle quadrotor controls by understanding the environmental impact of turbulence such as wind and waves.

Securing Your Digital World

*College of Professional Studies,
Security and Safety Leadership*

Your best friend sends you a link to a popular video through a social networking site. You go to the site without realizing that it has been hijacked by cyber criminals and your computer or mobile device is now a host to malware. The internet has a lot of benefits – especially for a techno-savvy criminal. Social networking sites, on-line gaming and other types of technology to deceive unsuspecting victims, allows criminals to gain full access to your computer and commit real world crimes. Test your knowledge and skills in identifying current online threats and how criminals use technology for exploitation. Phishing scams emerged over 15 years ago, but can you identify newer baiting tactics such as Botnets, XXS and Spear Fishing? How have sock puppets and avatars become the perfect disguise for criminal activities? Logon to any device and you create a digital footprint. Where does your footprint lead? Leading cybersecurity experts will guide you through the challenges of personal security in our cyber world and you will investigate cyber banking theft. Can you survive without comprising your identity, your data and your equipment?

Technology and the World of Nursing

School of Nursing

In a new era of health-care, technology plays a pivotal role in educating tomorrow's nursing leaders. In GW's Nursing Skills and Simulation Center, experience the world of simulation hands-on! In an interactive lab experience, utilize life-like high and low fidelity manikins and the latest computer technology to demonstrate task training and simulate patient care.

The Flight of a Ping Pong Ball

*School of Engineering and Applied Science,
Dept. of Mechanical and Aerospace Engineering*

How does an NBA center make that game winning three-point shot? How does the military accurately deliver supplies from an air cargo plane in the field? How does a toy manufacturer allow you to have the ultimate Nerf™ gun battle with your friends? They all have to understand the physics of projectiles and projectile motion! Experiment with the elements of projectile motion and learn about the dynamics of a particle as it flies through the air under only the force of gravity. Work in a team to build a projectile launcher and test your skills on determining launch angle, flight distance and launch velocity. Will your team have what it takes to create the winning launch vehicle?

The Science of Accident Investigation: NTSB and TWA Flight 800

*National Transportation Safety Board (NTSB)
Training Center*

In July, 1996, TWA Flight 800, a Boeing 747 bound for Paris, exploded and crashed into the Atlantic Ocean off the Long Island coast shortly after taking off from NY's Kennedy International Airport. All 230 people on board were killed. Early reports of the crash speculated that the plane was destroyed by a missile or a bomb. Was the crash due to a major structural failure? Could a design flaw have contributed to the accident? The incident turned into the most intensive and complex crash investigation in civil aviation history. The 93-foot reconstruction of the TWA 800 fuselage is used for training purposes at the NTSB Training Center located on the GW Virginia Science and Technology Campus. Apply scientific research and techniques to aviation accident investigations using TWA Flight 800 as a case study. Follow the fact-finding process, review the final analysis of the results, and compare that with the physical evidence of the actual reconstructed fuselage.

2013 WORKSHOP DESCRIPTIONS

Transportation Engineering and the Human Factor

*School of Engineering and Applied Science,
Dept. of Civil and Environmental Engineering*

A 2012 Urban Mobility Report named the Washington DC Metropolitan Area as having the worst traffic delays in the country. Drivers spent an average of 67 hours per year stuck in traffic, resulting in an additional 32 gallons of gas per car and a “congestion cost” of \$1,400 per driver. Utilize an interactive computer simulation model and learn how individual driver to driver interactions affect overall congestion and traffic flow. How do lane closures, limited access, varying weather conditions and an individual driver’s politeness factor influence the overall movement of vehicles and pedestrians throughout a region? Test your ability to positively affect regional traffic flow with your new understanding of human behaviors and the overall challenges of the transportation system!



When the Earth Moves: Designing Resistance to Earthquakes

*School of Engineering and Applied Science,
Dept. of Civil and Environmental Engineering*

As we know earthquakes can occur in almost any region of the United States or the globe. Large magnitude earthquakes also occur underwater and can create destructive tsunami waves that threaten the entire West Coast of the United States as well as many other countries. The largest earthquakes have caused devastating damage by the collapse of buildings, highways and infrastructure. In many instances an accompanying tsunami wave has swept more than 6 miles inland, leading to the displacement of tens of thousands of people.

In this workshop, learn how structural engineers use innovative concepts of analysis, construction, and testing methods to further enhance the resistance of buildings and bridges against earthquakes. Using the shake table, experience first-hand the impact of earthquakes on different types of buildings. This shake table is one of the largest six-degrees-of-freedom tables in the country, and one of only six with this degree of movement. Beneath the shake table is a huge mass of concrete weighing about 340,000 lbs. (or 170 tons) and reaching a depth of 25–30 feet. Eighteen H-shaped steel piles connect this concrete to the earth’s bedrock to stabilize the table and prevent its motion from being transferred to the building.

REGISTRATION DEADLINE

Tuesday, April 2, 2013

www.gwvirginia.gwu.edu/steday/

Staff Contact: Dova Wilson

Phone: (703) 726-3652

dova@gwu.edu