E-DAY OPEN HOUSE 2015

Nebraska Engineering

Welcome to E-Day Open House

Friday, April 17, 2015

University of Nebraska–Lincoln
College of Engineering
114 Othmer Hall | Lincoln, Nebraska
(402) 472-3181

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University of Nebraska Lincoln

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OPEN HOUSE SCHEDULE

TIME	EVENT	LOCATION
8:30 am	Registration/Check-In	NIC Conference Center Lobby
9:00 a.m. - 3:00 p.m.	Senior Design Projects, Corporate Sponsors, and Student Organization Displays and Exhibits	Banquet Hall / Hallways
9:00 a.m. - 3:00 p.m.	Hands-On Activities and Demonstrations	Breakout Rooms (1st Floor)
9:30 a.m. - 10:00 a.m.	Engineering Information Session (recommended for students in grade 9-11)	Auditorium (2nd Floor)
10:30 a.m. - 11:30 a.m.	**Keynote Speaker** Dr. Diandra Leslie-Pelecky, Author of "The Physics of NASCAR"	Auditorium (2nd Floor)
11:00 a.m. - 1:00 p.m.	Valentino's - Pizza $3 / Pepsi products $2 / Salad $5 / Chips $1	Lobby
11:45 a.m. - 12:15 p.m.	Engineering Information Session (recommended for students in grade 9-11)	Auditorium (2nd Floor)
Noon - 3:00 p.m.	Senior Design Projects, Corporate Sponsors, and Student Organization Displays and Exhibits	Banquet Hall / Hallways
1:00 - 3:00 p.m.	High School Bridge Building Competition	Rooms 112.2 and 112.3
3:00 p.m.	Open House Concludes	

MESSAGE FROM THE DEAN

Welcome to the 2015 Engineering-Day Open House

For many years, the UNL College of Engineering has hosted an open house to showcase our students' projects. This year, with the theme "Engineering New Horizons," we're celebrating not only the successes of our students across our three campuses, but also their impact throughout Nebraska and beyond.

This year, we're excited to have this annual event at Nebraska Innovation Campus, a new dynamic venue where university faculty, researchers and students connect with industry to create extraordinary innovations and ideas. It's a fitting location for our E-Day Open House, as our students have worked diligently on their senior design projects and in their clubs and organizations to solve "real world" problems.

At Nebraska Engineering, we're focusing on the success of our students. We want our graduates to be "complete engineers" who are competent in the technical skills as well as the essential non-technical skills. Through such activities as E-Day, research fairs, engineering competitions, and internships/co-ops, students gain experience in and out of the classroom.

Again, we are excited to have you join us for our E-Day Open House. Talk to our students and find out how they are working to make a difference, for the state and the world!

– Timothy Wei, Ph.D.
Dean

WELCOME FROM THE CHAIRS

Megan Auringer
Senior, Construction Management

Lisa Gran
Senior, Biological Systems Engineering

Hello and welcome to Engineering Day 2015 at the University of Nebraska-Lincoln! We are so excited that after months of planning and anticipation, you are all here to join us as the College of Engineering showcases our student research and activities.

Nebraska Engineering is full of possibilities, with so many opportunities to learn, succeed, and grow. We hope you take this day to do the same by exploring engineering through our student organizations, senior design projects, hands-on activities, and our speaker, Dr. Diandra Leslie-Pelecky.

It truly has been another exciting year at the college as we continue to "engineer new horizons" through the work of our outstanding students, faculty, and staff. We hope you experience this throughout the day. We feel so honored to have been able to plan this event and bring E-Day to life.

Thank you and welcome again to this exciting day!

THANKS!

Engineering Student Advisory Board, Engineering Ambassadors,
Student Volunteers, Faculty and Staff Volunteers,
Senior Design Students and Faculty, Dean Timothy Wei,
Associate Dean David Jones, Corporate Sponsors,
Senior Design Project Judges, Engineering Dean's Advisory Board,
Friends of the University of Nebraska-Lincoln College of Engineering (FUNCET),
Engineering Student Organizations, Nebraska Innovation Campus

KEYNOTE SPEAKER

Dr. Diandra Leslie-Pelecky
author, educator, researcher

10:30-11:30 a.m.
Nebraska Innovation Campus
Conference Center Auditorium
(2nd Floor)

Diandra Leslie-Pelecky earned undergraduate degrees in physics and philosophy from the University of North Texas and a Ph.D. in condensed matter physics from Michigan State University. She spent the majority of her 20-year academic career as a nanomaterials researcher and educator at the University of Nebraska–Lincoln.

Her research in magnetic nanomaterials was funded by the National Science Foundation, the National Institutes of Health, the Department of Defense and the Department of Energy. She developed fundamental understanding of magnetic materials as well as applications of nanomaterials to medical diagnosis and treatment processes such as magnetic resonance imaging and chemotherapy. Leslie-Pelecky is nationally recognized for her work in science education and outreach at all levels, having directed projects education and outreach projects funded primarily by the National Science Foundation.

Leslie-Pelecky is a popular speaker with technical and non-technical audiences, including addresses for the public sponsored by the American Association for the Advancement of Science, numerous science museums, and the American Physical Society. Her book, *The Physics of NASCAR*, was excerpted by Time magazine and has been featured in publications from the Materials Research Bulletin to The Sporting News. Her blog — *www.buildingspeed.org/blog* — focuses on the science of motorsports and is avidly read by NASCAR fans and insiders.

Diandra has written for and appeared in number of motorsports-related television broadcasts, including segments for ESPN (one of which won the 2010 Aflac Motorsports Journalism Award of Excellence), an episode of the Emmy-winning series *Quest for the Cup*, was host and writer for the National Science Foundation project *The Science of Speed*, and will appear in a segment for the upcoming History Channel show *Invisible*. She is a bi-weekly guest on the *SiriusXM Speedway* satellite radio program where she uses science to debunk "NASCAR Myths" for motorsports fans.

HANDS-ON ACTIVITIES & DEMONSTRATIONS

GET IT WRIGHT: INTRODUCTION TO FLIGHT

Engineering Student Ambassadors Network

Times:	Continuous demonstrations during morning hours.
Location:	Room 110.1.
Objective:	The objective of this activity is to introduce concepts related to flight, aerodynamics and flight properties.
Materials:	Construction paper.
Activity:	Flight-related demonstrations and activities.

CLEAN WATER CRISIS

Engineering Student Ambassadors Network

Times:	Continuous demonstrations during afternoon hours.
Location:	Room 110.1.
Objective:	The objective of this activity discuss the clean water crisis in the world and various engineering techniques used to solve the water problem.
Materials:	Sand, gravel, marbles, cotton balls, cups, empty soda or water bottles, and dirt.
Activity:	Water filtration demonstrations and activities.

ENGINEERING, BUOYANCY, AND BOATS

Engineering Student Ambassadors Network

Times:	Continuous demonstrations during afternoon hours.
Location:	Room 110.1.
Objective:	The objective of this activity is to talk about various types of boats and what makes them float as well as the engineering behind buoyancy and boats, followed by activities building boats and testing buoyancy.
Materials:	Two large clear tubs, foil, pennies, colored paper, tape, and crayons.
Activity:	Buoyancy and boat-related discussions and activities.

HANDS-ON ACTIVITIES & DEMONSTRATIONS

PASTA POWER TOWER

Tau Beta Pi (engineering honor society)

Times:	Continuous demonstrations, 9 a.m. – 3 p.m.
Location:	Room 110.2
Objective:	The objective of Pasta Power Towers is to foster engineering ingenuity and talent through a simple and intuitive competition.
Materials:	Pasta noodles and marshmallows.
Activity:	Students have a set amount of time to create a stable, self-supporting structure out of just marshmallows and uncooked pasta noodles. The goal is to create the tallest tower. The supply of noodles and marshmallows, as well as time, is limited, prompting students to construct a solid plan and execute accordingly. The speedy group competition promotes teamwork and communication skills, while the slower, longer solo competition encourages critical thinking and problem solving.

"BREAK THE SAFE"

Association of Computer Machinery (ACM)

Times:	Continuous demonstrations, 9 a.m. – 3 p.m.
Location:	Booth
Objective:	Open a shoebox safe without destroying it or setting off an alarm.
Materials:	Batteries, shoeboxes, buzzers, wire, LEDs, 330-ohm resistors, microswitches, conductive duct tape.
Activity:	Students are invited to attempt to open a safe without destroying it or setting off an alarm. It's up to the participants to think of possible "bugs" with the safe, or various things the designer didn't account for to access the contents.

HANDS-ON ACTIVITIES & DEMONSTRATIONS

PING-PONG BALL LAUNCHER

***Pi Tau Sigma** (Mechanical Engineering Honor Society)*

Times:	Continuous demonstrations, 9 a.m. – 3 p.m.
Location:	Room 112.1
Objective:	To design and construct a launcher that will consistently launch ping pong balls up to 30 feet.
Materials:	Ping-Pong ball, can of pop, spoon, mousetrap, straws, Popsicle sticks, rubber bands, and paper clips.
Activity:	A Ping-Pong Ball Launcher is to be designed to consistently launch a ping-pong ball up to 30 feet in distance. Participants will have five attempts to launch the ping pong ball through a goal post and will receive points based on the distance from where the ball is launched to the goal post.

RUBE GOLDBERG COMPETITION

The American Society of Mechanical Engineering (ASME)

Times:	Continuous demonstrations, 9 a.m. – 3 p.m.
Location:	Room 110.3
Objective:	To engage students (hoping for the late elementary school to middle school age) in a fun, yet applicable engineering problem. In practice, engineers are given a set of tools, materials, and a task to accomplish – however, it's up to them to decide how to do it! The Rube Goldberg competition is meant to give students an idea of how to quickly solve problems and work with limited resources.
Materials:	Various materials including paper, scissors, old books, tape, marbles/balls, board game pieces, dominos, string, balsa wood.
Activity:	The ASME student organization will be hosting its first Rube Goldberg Competition, in which students build machines with complicated contraptions that work in sequence to achieve a simple task. Many steps are involved, for example a ball knocks over a domino, which flips a cup that rolls down to…. etc. The exact task (ring a bell, flip a switch, etc.) and rules will be dependent on the materials we can gather. Machines will be judged on their ability to accomplish the task, style points, and overall length of the machine.

HANDS-ON ACTIVITIES & DEMONSTRATIONS

ROBOTICS COMPETITION

Institute of Electrical and Electronics Engineers (IEEE)

Times:	Continuous demonstrations, 9 a.m. – 3 p.m.
Location:	Room 118
Objective:	To allow an opportunity for non electrical engineers (especially prospective electrical engineers) to interact with current students in a friendly and relaxed environment. The robots will be controlled via remote control (similar to that of a gaming console) and the operator does not need to know anything about electrical engineering to operate it. The electrical engineers present should have the knowledge to explain how the system works to a fairly specific degree. This lets prospective students get a chance to interact with current EE students, offering them the opportunity to see what an EE degree could mean to them.
Materials:	Masking Tape, CEENBoTs, tennis or soccer ball.
Activity:	Modifying CEENBoTs and competing in two different tasks including a "Sumobot" competition and object retrieval mission.

LIQUID NITROGEN ICE CREAM

AIChE (American Institute of Chemical Engineers)

Times:	Continuous demonstrations, 9 a.m. – 3 p.m
Location:	Booth
Objective:	Students will learn the process of heat transfer and phase change.
Materials:	Heavy cream, half-and-half, granulated sugar, vanilla, chocolate syrup, strawberry syrup, Oreos, liquid nitrogen.
Activity:	AIChE will demonstrate how to make liquid nitrogen ice cream and serve Dairy Store ice cream.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

American Society of Civil Engineers (ASCE)

Poster Display, Steel Bridge, Concrete Canoe, GeoWall and Concrete Bowling Ball

ASCE has four competition teams: Steel Bridge, Concrete Canoe, GeoWall, and Concrete Bowling. Once a month, we have a general meeting and bring in professionals to talk about civil engineering-related topics. The steel bridge team designs a bridge based on the rules for the steel bridge competition each year. Over the fall months, we meet regularly to design our bridge using computer software. During the design process, we focus on the factors that will account for our total score in competition: weight, construction time, deflection, and appearance and aesthetics. In the spring, we fabricate and weld the bridge together. The concrete canoe team designs and builds a canoe made of concrete. In the fall, we meet every week to mix concrete designs, make and break cylinders, and build the concrete form. Early in the spring, we place the concrete canoe and paint it once it's cured. All four of the competition teams compete every year at Mid Continent Regional Conference. This year, it is in Lawrence, Kansas.

Pi Tau Sigma

Hands-on Activity: Ping Pong Ball Launcher

Pi Tau Sigma is a national mechanical engineering honor society recognizing the top 25 percent of mechanical engineering students. The Nebraska Pi chapter focuses on community service and professional development throughout its yearly activities.

Engineers Without Borders (EWB)

Poster Display

Engineers Without Borders-USA (EWB-USA) is an international non-profit organization committed to improving the quality of life in developing communities through the implementation of environmentally sustainable, equitable, and economical engineering projects. While advancing the quality of life in these communities, EWB-USA works to develop globally aware and personally responsible engineers and students.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

American Institute of Aeronautics & Astronautics (AIAA)

Poster Display, NASA RMC Robot, IREC Rocket, DBF Plane and RockSat-X Payload

The American Institute of Aeronautics and Astronautics (AIAA) Club is a student-run organization that consists of four design teams and one research team with a focus on integrating an aerospace experience into a student's Nebraska Engineering experience. NASA Robotics Mining Competition is a NASA-sponsored competition in which teams design a robot that can operate from afar as a simulated landing on the moon or Mars. The robot must mine "regolith" or simulated dirt, and deposit it into a research bay. UNL Rocketry participates in the Intercollegiate Rocket Engineering Competition (IREC) and the NASA University Student Launch Initiative (USLI) Competitions each year. This team designs a research-carrying payload rocket and builds it from scratch each year for competition with schools from all over the world. Design, Build, Fly (DBF) is a worldwide collegiate competition in which students design, build, and fly a remote-controlled airplane under the mission requirements. RockSat-X is a research partnership with NASA's Wallops Flight Facility and the Colorado Space Grant Consortium that gives students the opportunity to design a microgravity research payload that flies on a Terrier Orion Improved Malemute Sounding Rocket to an altitude of 100 miles.

American Institute of Chemical Engineers (AIChE)

Poster Display, Liquid Nitrogen Ice Cream and Dairy Store Ice Cream

AIChE is designed to allow chemical engineering students to network with other young professionals, have an insight into various career pathways, build leadership skills, and access to many technical resources. In the Lincoln chapter, we attend regional conference, have monthly meetings focusing on professional development, participate in volunteering events around the community, and have a Chem-E-Car team. AIChE is a student organization that helps our members learn more about the field of chemical engineering. We accomplish this by organizing chemical plant tours, attending regional and national conferences, and hosting speakers from industry and academia. We also provide tutoring services for underclass students and hold many social events throughout the year.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

Husker Motorsports/UNL Formula SAE

Poster Display and Formula SAE Cars

Husker Motorsports is a student-run organization comprised of 45 students ranging from freshmen to graduate students. The team designs, constructs, and races and open-wheel, formula style race car in one of the world's largest design competitions: Formula SAE. Approximately 500 teams from around the world participate in the program, with around 150 of those teams coming from North America. Students participating in our program receive valuable insights into both the engineering and business aspects of design. Additionally, our program allows these students to communicate and network with companies and other individuals with whom we work. As a result, participating in Formula SAE gives students the experience and knowledge to help them prosper in their chosen career paths.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

Tau Beta Pi

Hands-on Activity: Pasta Power Tower

Tau Beta Pi is the only engineering honor society representing the entire engineering profession. It is the nation's second-oldest honor society, founded to recognize students of distinguished scholarship and exemplary character.

Baja SAE (Society of Automotive Engineers)

Poster Display and Cars

Baja SAE (Society of Automotive Engineers) consists of three regional competitions that simulate real-world engineering design projects and their related challenges. Engineering students design and build an off-road vehicle that will survive the severe punishment of rough terrain. The object of the competition is to provide SAE student members with a challenging project that involves the planning and manufacturing tasks found when introducing a new product to the consumer industrial market. Teams compete against one another to have their design accepted for manufacture by a fictitious firm. Students must function as a team to not only design, build, test, promote, and race a vehicle within the limits of the rules, but also to generate financial support for their project and manage their educational priorities. All vehicles are powered by a 10-horsepower Intek Model 20 Briggs & Stratton engine. Use of the same engine by all the teams creates a more challenging engineering design test. In order to be competitive, it is crucial to design the lightest car possible while maintaining the necessary strength to endure the brutal challenges faced at competition.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

Association of Computer Machinery (ACM)

Poster Display, Hands-on Activity: "Break the Safe"

At an international level, ACM is widely recognized as the premier membership organization for computing professionals — delivering resources that advance computing as a science and a profession, enabling professional development, and promoting policies and research that benefit society. At UNL, our goal is to give those who wish to learn more about programming beyond normal computer science courses the tools they need. We also want to open the world of programming to beginners, some of whom may not be majoring in computer science or computer engineering. ACM partners with Hive, another student organization, to host workshops and teach subject matter that is usually not covered by most computer science courses. HTML, CSS, PHP, Javascript and other web development tools have been taught in previous workshops as well as mobile app development and more.

Quarter Scale Tractor Team

Senior Design Project and Tractor

Quarter Scale is an ASABE-sponsored student design competition, in which students design and build a 1/4 scale-sized tractor. It is an all-encompassing design scenario, in which students conceptualize, design and build a tractor from scratch, and develop a target market and a production plan to sell a set number of the tractors.

STUDENT ORGANIZATION DISPLAYS / EXHIBITS

Engineering Ambassadors Network

Poster Display, Hands-on Activities: Get it Wright: Introduction to Flight, Clean Water Crisis, and Engineering, Buoyancy and Boats

The Engineering Ambassador Network is a student-led initiative to promote engineering. Student representatives visit local and regional K-12 schools — from Omaha to Lincoln, York to Hastings and to Kansas, Iowa and beyond. Interactive presentations and hands-on activities are delivered in a variety of fashions to K-12 students. As a result, these younger students can see the many exciting opportunities found in engineering while Ambassadors show that engineering degrees are feasible (and enjoyable!) and involve more than meets the eye. Engineering Ambassadors are students who enjoy talking with younger students while answering questions, providing advice, and sharing their passions about their majors. The presentations are strictly limited to engineering outreach and are not recruitment based. The presentations are interactive and meant to serve as a bridge between classroom theory and the application of math, science, and communication skills in the engineering career fields.

The American Society of Mechanical Engineering (ASME)

Hands-on Activity: Rube Goldberg Competition

The American Society of Mechanical Engineers (ASME) group at UNL is a chapter of the national non-profit organization that helps stimulate engineering partnership and teamwork through a diverse membership. At UNL, ASME offers collaboration between students of varying levels of experience, enhancing knowledge and experience in the field of mechanical engineering. The club strives to make its members better engineers by helping them stay up-to-date with the field of mechanical engineering by hosting monthly guest speakers, business meetings, and design competitions.

SENIOR DESIGN PROJECTS

AGRICULTURAL ENGINEERING

http://agen.unl.edu | (402) 472-1413

Quarter Scale Sled

Austin Bollacker, Ian Schuster, Casey Wallin, Jacob Harms

ADVISOR: DR. ROGER HOY

The current UNL pull sled that the Quarter Scale team uses does not give results consistent with the pulling sled used in competition. Our goal is to determine what is causing the problem and redesign the issue component to better represent the competition sled. This includes comparing previous competition pull profiles and observing where the current sled's profiles vary. After completing this, we will go forth with the information and deduce what a cause of the issue may be. When that is done, we will make the adjustments and come up with a final design that could be implemented depending upon the amount of time allotted to complete the project.

Improved Draper Head

Kevin Pulec, Tyler Manning, Dylan Smith, Nick Christensen

ADVISOR: DR. JOE LUCK

Our senior design project through CLAAS in Omaha is to make the Draper head of a combine self-adjusting, improving the previous head that had to be changed by removing and replacing hardware.

Quarter Scale Tractor IVT Transmission

Luke Prosser, Robert Olsen, Jake Walker, Caleb Lindhorst

ADVISOR: DR. ROGER HOY

Our project is to design and build an Infinitely Variable Transmission (IVT) for use in the Quarter Scale Tractor for the ASABE student design competition.

SENIOR DESIGN PROJECTS

BIOLOGICAL SYSTEMS ENGINEERING

http://bse.unl.edu | (402) 472-1413

ConAgra Cookie Topper

Claire Uryasz, Julia Burchell, James Yong, Brian Burris

ADVISOR: DR. CURTIS WELLER

The team has designed a mechanism that will more efficiently top cookies with granulated sugar in an assembly line. The design will minimize the loss of sugar that is not deposited on the cookie, thus decreasing the amount of sugar lost onto the belt. This increase in topping efficiency will lead to a more efficient process overall as ConAgra team members won't be required to clean caramelized sugar from the conveyor belt as frequently.

Biological Systems Engineering - CONTINUED

ASABE Fountain Wars: Task Two Basketball Shootout

Bethany Brittenham, Mitchell Goedeken, Mallory Morton, James Sinclair
ADVISORS: DR. DEREK HEEREN & DR. DEAN EISENHAUER

The Fountain Wars senior design team strives to maximize the number of competition points earned with a design for the Basketball Shootout technical task as outlined in the 2015 American Society of Agricultural and Biological Engineers (ASABE) Fountain Wars competition rulebook. Points are awarded on the following basis, and the team scoring highest earns 75 points. Five points are awarded when the flight of a launched ball enters the hoop set at 39.5 inches, and three points result if the ball hits the hoop or rim, but doesn't complete the basket. If the ball travels for at least 4 feet, one point will be awarded. To maximize points, the team will develop a design to shoot all three provided balls into the hoop within the three-minute contest period. The hoop is positioned 6 feet from the edge of the pool.

Within the $200 specified budget, the team will utilize piecewise comparison to develop an economic design. Factors of focus include accuracy, precision, and quality of materials with an emphasis on the use of biological materials. All energy used to move the ball must originate from work done by the pump.

In preparation for competition requirements, the team develops a systematic method to assemble the materials quickly and without error. The material transport method serves as a guideline for natural breakdown of any large structural pieces. The team design will compete in July at the ASABE International Meeting in New Orleans, Louisiana.

ConAgra Lofthouse Sugar Cookie Shelf Life Extension

Ellen Emanuel, Benjamin Joekel, Aaron Matzke, Rachel Morford
ADVISOR: YUFENG GE

Currently, Lofthouse cookies are packaged in plastic clamshell containers and stored frozen until they are placed on a store shelf. From the day they are thawed on the shelf, they have a shelf life of 28 days. Extending the shelf life would broaden the consumer market for the cookies. Specifically, better packaging would allow them to be sold in stores that do not have sufficient freezer space to maintain the freshness of the current product. After collecting empirical data to determine the shelf-life mode of failure, we will recommend a new packaging design against the mode of failure in order to extend the shelf life of the cookies while maintaining their organoleptic properties and economic feasibility.

Biological Systems Engineering - CONTINUED

Lake Zorinsky Water Quality Basin Design

Emily Klimisch, Megan Lush, Amy Fosler, Tu Doan
ADVISOR: DR. FRANCISCO MUNOZ ARRIOLA

The project establishes the preliminary design for the last of four water quality basins for Lake Zorinsky in Omaha, Nebraska. After analyzing and updating four existing alternatives and offering a no-action alternative, a recommendation for action by the Papio-Missouri River Natural Resources District is made. Building upon the existing alternatives, an ideal design is presented, with a tiered approach to demonstrate the costs and effects associated with each tier.

Small-Scale Anaerobic Digestion for the Family Farm

Skylar Falter, Isaiah Krutak, Linkai Mei, Matt Pirog
ADVISOR: DR. MINARICK

We designed an anaerobic digester for managing the bedding and manure resources at a small-scale family farm in a manner that reduces labor, generates energy and provides a nutrient by-product for field application.

McKenzie's Mobility Team

Ted Kocher, Emily Harrison, Jared Beyersdorf, Kelli Rice
ADVISOR: JENNIFER MELANDER

Our client, McKenzie, has athetoid cerebral palsy. Because her condition is severe, she must use a wheelchair. When she is at home, she sits in a tomato chair, which provides her with more comfort. Unfortunately, she has outgrown the base that goes along with the chair and needs a new chair base to allow her to move about the house on her own. Also, while using the tomato chair and base, McKenzie uses a tray to assist her in holding her Kindle, phone, etc. This is outdated, so she would like a new tray as well. Therefore, our goal is to design and fabricate a new chair base and tray table to give McKenzie more independence.

ConAgra Food Temperature

Matt Hedrick, Cal Harman, Erica Geis, Audrey Vacha

The goal of this project is to design a system that records and graphs the temperature of foods at different depths.

Biological Systems Engineering - CONTINUED

Water Pressure

Philip Hochstetler, Anna Sorensen, Alexander Boyce, Paula Andrie
ADVISOR: DR. SANTOSH PITLA

The goal of our project is to automatically regulate the water pressure in a pivot. When the end gun on a pivot shuts off, pressure spikes in the pivot. The main objective of our project is to design a control system that adjusts the pressure automatically by speeding up and slowing down the engine. We intend to do this with a microcontroller that will use a pressure sensor at the well to determine if and when the pressure is at the proper level and also use a stepper motor to adjust the engine speed.

Blast Media Sifting & Reclamation

David Bunker, Connor Hansen, Hayden Kaderly
ADVISOR: DR. JEFF WOLDSTAD

Ebola Challenge

Rudolph Lackner, Ethan Monhollon, Nick Vandenberg, Ye Hui Zhang
ADVISOR: DR. MARK RILEY

Our project is outlined in a Broad Agency Announcement from the United States Agency for International Development. Our group is to engineer improvements in current personal protective equipment protocol and/or design so as to maintain the utmost standard of safety while augmenting the comfort levels of and duration of time a singular protective suit can be worn by an Ebola care worker.

Solar-Powered Water Purifier

Felipe Alves, Lisa Gran, Spencer Moore, Hillary Stoll
ADVISOR: DR. MILFORD HANNA

The design of a device that purifies water using solar power and can be built, disassembled, and shipped in a cost-effective way in order to reach developing countries.

Biological Systems Engineering - CONTINUED

Vein Attachment

Tasneem Bouzid, Matt Benson, Eric Hofferber, Erica Carder, Tuan Nguyen
ADVISOR: DR. ANGELA PANNIER

The time between removing the donor liver from ice to completing the surgical anastomosis of blood vessels in the recipient is too long. Our goal is to design a biocompatible system to reduce the time of each vein anastomosis to less than 10 minutes during a liver transplant while withstanding physiological conditions.

Noise Abatement (Schneider Electric)

Sara Hutcheson, John Bader, Brenden Lopp, Elizabeth Phillips
ADVISOR: DR. JEFF WOLDSTAD

Schneider Electric is a global specialist in energy solutions for efficiency, power control, and renewable energy with operations in more than 100 countries. Their plant in Lincoln specializes in the manufacturing of circuit breakers. Manufacturing of these devices involves many metal parts and processes that produce excessive amounts of noise. A major source of this noise is the process of using the "hoppers," which pick up and shake bins of metal parts onto a line to be plated. According to OSHA standards, there is a maximum amount of noise that workers can be exposed to on a daily basis. Our objective was to analyze and reduce the noise created by the "hoppers" and experienced by Schneider Electric employees. Implementation of our design will result in a safer work environment.

SENIOR DESIGN PROJECTS

CHEMICAL ENGINEERING

http://che.unl.edu | (402) 472-1551

ADVISOR TO ALL CHME PROJECTS: DR. YASAR DEMIREL

Chemical Looping Power Plant

Eric Wall, Devin Dey, Matt Gutzmer, Dylan Winter

Power will be produced utilizing a chemical looping process rather than a coal combustion one. This process utilizes a metal oxygen carrier rather than a pure air stream, causing an oxidation-reduction reaction rather than a straight combustion one. This should reduce the nitrogen oxide and sulfur oxide emissions. The plant will also utilize a Fischer-Tropsch process in order to reclaim the carbon monoxide emissions. This process will return the spent carbon monoxide back into an octane or kerosene-type fuel. These fuels can be sold to help make the plant more economical.

Bioethanol Production from Corn Using Two-Column Entrainment

Aaron Kern, Chad Pruehs, Ewe Beng (Benny) Ng

Bioethanol production from corn is vital to the economy of Nebraska. A reliable method of producing an alternative fuel to gasoline, the production process is constantly being altered as new technology and methods are being discovered and analyzed. The purpose of this project is to analyze bioethanol production using an organic solvent, two distillation columns, and a decanter to refine the ethanol-water mixture resulting from fermentation. An organic solvent will be added to the ethanol-water mixture which will enable a two-column/decanter setup to produce 99.9 percent pure ethanol via tertiary equilibrium distillation. This differs from the normal industry model where a conventional distillation column is used on the fermentation stream to reach the ethanol-water azeotrope, and then a molecular sieve is used to dehydrate ethanol to a specified purity. This new method eliminates the need for molecular sieves to dehydrate ethanol after distillation. A comparison of a two-column/decanter system versus a column/molecular sieve system will be analyzed to determine if required maintenance, associated down time, and product quality reliability are comparable. Solvent recovery, carbon dioxide recovery and processing, and alternative uses for distiller grains will also be analyzed to determine the economic benefits and detractors of using this new system. Energy recycling methods with this new design will be optimized to improve system profitability. Safety analysis and green engineering analysis will be performed to determine if these proposed process changes are preferable to current industry production methods.

Chemical Engineering - CONTINUED

Second Generation Bioethanol Production with AFEX Pretreatment

Alyssa Soulvie, Luke Honnen, Ryan Wood, John Burke, Lucas Ferreira

Through Aspen Plus simulation, we produced a design of a second-generation bioethanol production process, which generates 50 million gallons per year of fuel-grade ethanol. The process uses AFEX (ammonia fiber expansion) pretreatment and a lignocellulosic fuel source to ensure the process is environmentally friendly and economically viable.

Production of Biodiesel

Kate Sonnenfeld, Tyler Lind, KayLeigh Campbell, Andrew Bro

Production of biodiesel provides a clean alternative to petroleum fuels. This project's goal is to create an industrial plant that produces 1,000 kilograms of biodiesel fuel per hour with 99.7 percent purity. This fuel is produced from unused vegetable oil with methanol and inorganic and biological catalysis. The focus of the project is to make the process more economically and environmentally friendly. An ultrasound-assisted reactor will be incorporated into the design, providing a means to transfer energy to the fluid and forming cavitation bubbles that produce intense mixing. This higher intensity increases the wave penetration. Benefits of this process include reducing the amount of catalyst used, decreasing reaction time, and reducing energy consumption.

DMC Production

Nathan Hunt, Matt Hames, Mitchell Ferris, Bryan Farley, Vonzell Mansfield

Our goal is to develop an economically feasible and environmentally responsible process for the production and purification of dimethyl carbonate to 99.8 percent purity at a rate of 11,900 kilograms per day.

Cellulase Production

Dillon Gushard, Chris Velander, Xin Gao, Phillip Power

We are designing a manufacturing facility to provide cellulytic enzyme (cellulase) for the biofuel market in the Midwest. The production strain will be Trichoderma reesei. The facility will produce 20,000 metric tons per year of unrecovered fermentation broth (production strain inactivated).

Chemical Engineering - CONTINUED

Wet Natural Gas Converted to Olefins and Alcohol

Ryan Splichal, Ian Thackray, Connor Jucht, Tom Laney, Renato de Melo Neto

Our team has been informed of excess wet natural gas with given composition and flow of 5,000 tons per year. We have determined that the most economically beneficial option for it is to convert the heavier ends to olefins (alkenes) and alcohols. The process will include cryogenic separation, distillation, reactors, and numerous heat recovery units. The final presentation will include simulation by Aspen Plus and economic analysis.

Power Plant Retrofit for Carbon Capture and Utilization

Dorothy Chen, Zach Foster, Anh Nguyen, Katie Sanderson, Mike Van Beek

In partnership with Nebraska Public Power District (NPPD), this project will investigate methods of carbon capture and utilization at the Gerald Gentlemen Power Station in Sutherland, Nebraska. A process solution will be proposed to capture 90 percent of the carbon dioxide emitted in the flue gas of the power station while minimizing capital cost and energy penalty.

SENIOR DESIGN PROJECTS

CIVIL ENGINEERING

http://civil.unl.edu | (402) 472-2371 Lincoln, (402) 554-2462 Omaha

ADVISOR TO ALL CIVE TEAMS: CARTER HUBBARD

16th & Y Street Drainage and Utilities

Austin Costello, Sandip Timsina, Levi Brown, Rachel Defusco, Spencer Johnson

This project involves assessing drainage issues on the northeast corner of the University of Nebraska-Lincoln city campus. Our team's goal will be to improve drainage in the area in a sustainable fashion, while maintaining functionality to all utilities and proper mobility for both automobile and pedestrian traffic.

Bugeater Engineering, 16th and X Street drainage project

Nate O'Keefe, Jason Sindelar, Max Kreuzberg, Daniel Goodwin, Bin Wu

We are examining the drainage issues at the intersection of 16th and X streets and developing sustainable solutions for water, geo-technical, environmental, structural, and transportation issues.

Concept Design 16th and Y Street Drainage and Utilities

Braulio Araya, Thomas Faulconer, Lucas Castro, Paige Schneider, Alney Tobias

Drainage will be improved on campus between 14th and 16th street. Storm water will drain north into antelope creek and improvements will be made to the 16th and X street intersection. The proposed solutions to the drainage will comply with UNL's master plan as much as possible.

16th & X Street Drainage and Utilities

Alex Klein, Courtney Fuhrer, Ali Schrack, Martina Stangler

Our group will provide a conceptual design of storm water drainage and utility improvements in the vicinity of 16th and X streets. The area is experiences ponding of storm water runoff, which presents a potential flood threat to buildings in the area. In order to fix these problems, the affected area needs to be examined and drainage solutions need to be developed to prevent flooding. Also, a 30-inch pipeline is requested to convey chilled water along 16th Street from a thermal storage tank.

16th & X Street Drainage

Anthony Cameli, James Kuzelka, Kai Yueh Chin, Cara Woldt, Amanda Dunekacke

We will be discussing drainage improvements to the 16th & X street area.

Civil Engineering - CONTINUED

16th & X Street Drainage

Abigail Allgood, Ryan Kubert, Lionel Ishimwe, Adarsh Jnwali

Our objective is to provide concept design plans for fixing the ponding of storm water runoff in the low flat area in the vicinity of 16th and X Streets on the University of Nebraska-Lincoln's City Campus. Our drainage improvements will affect the area from 14th Street eastward north of W Street to prevent flooding of surrounding streets and buildings. The project will prevent roadway ponding of more than 6 inches during a 10-year storm, and provide 6 inches of freeboard for surrounding buildings during a 100-year storm. In addition to the drainage improvements, we will plan the installation of a new 30-inch pipeline to transport chilled water from a new thermal storage tank located at the north end of 16th Street. The chilled water pipeline will run from the storage tank below 16th Street. All of these new utilities will have to be implemented around myriad existing utilities in the project area. Our final concept design will include solutions from five areas of civil engineering — water resources, environmental, geotechnical, structural, and transportation solutions. We will work with the University of Nebraska and the City of Lincoln to determine appropriate sustainable solutions to implements in our final concept design.

Concept Design for 16th & X Street Drainage and Utilities

Austin Haase, Alexandra Berney, Jennifer Hagan, Michael Holton, Matthew Welker

Our team is performing a hydrologic and hydraulic analysis for the area located on City Campus, north of W Street and between 14th and 16th streets. With this information we will make improvements to the existing storm water drainage system to mitigate the ponding that occurs at the sag on 14th Street, located adjacent to the UNL Outdoor Adventure Center, and at the intersection of 16th and X streets. We will also make the necessary improvements to install a 30-inch pipeline to convey chilled water, along 16th Street, to and from a new thermal storage tank. In addition to these improvements, we will perform a traffic study to determine if additional traffic control is necessary on 16th Street and/or if the intersection of 16th and X streets needs to be redesigned. Along with these improvements we plan to evaluate the current environmental conditions and prepare potential solutions to soil contaminants and storm water pollutants. At the same time, we will evaluate the current soil conditions and determine if they are suitable for the necessary improvements. Furthermore, we will evaluate the existing structures and the new structures required for the proposed drainage and utility improvements.

Civil Engineering - CONTINUED

16th and X Street Drainage and Utilities

Ben Batenhorst, Kyle Christensen, Christopher Marker, Todd Pernicek, Michael Steffensmeier

The majority of the UNL City Campus storm water runoff drains north along 14th and 16th Streets to a low flat area located north of W Street. The low flat area experiences frequent ponding of storm water runoff and the runoff presents a potential flood threat to buildings in the area. Our team looks to improve the drainage conditions from 14th Street eastward in order to prevent potential flooding of the streets and surrounding buildings. The scope of work includes: designing a new storm sewer, performing an environmental impact study, address soil contaminants, design a larger retaining wall along 16th street, as well as an analysis of the intersection at 16th and X Street.

SENIOR DESIGN PROJECTS

COMPUTER ENGINEERING/ELECTRONICS ENGINEERING

http://ece.unl.edu | (402) 554-2288

ADVISOR TO ALL TEAMS: HERB DETLOFF

Real-time EOT AEI Location System (REALS)

Zane Tarumoto, Sam Arwood, Jeff Gruhn, Shaun Wood

Union Pacific maintains an inventory of End of Train (EOT) devices on hand in all of its train yards. These devices cost upwards of $3,500 and are an integral part of the train. UP desires to create a cost-effective inventory management system for the EOT devices. The inventory management system needs to be able to read the EOT's Automatic Equipment Identification (AEI) tags and report inventory periodically. The Real-time EOT AEI Location System (REALS) will be the product produced for senior thesis. The system contains will read AEI tags from EOT devices located in a storage rack, produce a real-time inventory of all EOT devices, and provide location data for inventory over a network interface to update on-hand inventory to a central system within Union Pacific.

Daycare Bracelet System

Austin Couch, Aaron Dittmar, Anthony Balmer, Samuel Garcia

The Daycare Bracelet System design project consists of four major design components: a bracelet, base station, charging station and desktop software. The main goal of the system is to enhance the child collection/delivery process in a daycare environment. The comprehensive flow of the system should go as follows: A parent or guardian will register themselves and their child into the Daycare Bracelet System by way of the base station and desktop software. A bracelet, which has been adequately charged by the charging station, is given to the child to be worn throughout their stay in the daycare. At the end of the day, the parent or guardian will sign in to the desktop software, by way of the base station, which will allow them to call for their child. The desktop software will communicate to the bracelet, that the corresponding child is wearing, which will notify personnel in the area that the child needs to be delivered to their parent or guardian at the front desk. The bracelet will then be connected to the charging station to be charged for next use.

Computer Engineering/Electronics Engineering - CONTINUED

Rain Rover

Warren Drucker, David Tran, Emaan Ali, Corey Conz

The Rain Rover's purpose is to introduce an automatic watering system that is less expensive than an In Ground Irrigation System and requires less user interaction than the Rain Train®. The Rain Rover is a programmable water-propelled sprinkler system that consists of three main parts: the Rover, the faucet control device, and an Android application. The Rover will navigate the user's yard with several sensors that are mounted on the front, and a GPS module. To control the water flow to the Rover, a faucet control device communicates with the Rover via Bluetooth. The schedule for the Rover is transmitted from the Android app via Bluetooth. Operation of the Rain Rover System starts the app being used to set the time for the system to start watering the yard. After establishing the schedule, the user will connect to the Rover the App and send the start times. The Rover will know when to start by using the GPS module's real-time clock. When the start time occurs, the Rover will send a signal via Bluetooth to the faucet control, which will turn on the water. Using a combination of GPS coordinates, ultrasonic sensors, and infrared range sensors, the Rover will navigate the user's yard under the power of water pressure generated by the hose. Once navigation is complete, the Rover will send a signal to the faucet control device to turn off the water.

Digital Dynamic Cluster

Jacob Baker-Anderson, Kenton Carson, Matthew Braden

The project that we have selected will be a digital dashboard system for an automobile. This dashboard will have a customizable layout to display engine diagnostic data that would not normally be displayed by the average factory gauge cluster. An average factory cluster would display engine speed, vehicle speed, coolant temperature, and fuel level. The product we intend to produce will display all of the parameters of a factory cluster with the addition of alternative measurements. It will also aid in the tuning of the engine by performing data logs. This project will be appreciated by automotive enthusiasts who spend large amounts of time and effort building and maintaining their engines. Currently, there is no product on the market that fits our vision. The product we intend to produce will assist performance engine builders in tuning their engines properly and safely while allowing them to keep an eye on all key parameters while driving their vehicles.

SENIOR DESIGN PROJECTS

CONSTRUCTION MANAGEMENT
(THE DURHAM SCHOOL OF ARCHITECTURAL ENGINEERING & CONSTRUCTION)

http://cm.unl.edu | (402) 472-3742

ADVISOR TO ALL PROJECTS: TIM WENTZ

EDGE Homes Zero Net Energy House

Logan Hestermann, Josh Dougherty

We were tasked with designing a Zero Net Energy Ready home for Habitat for Humanity. We were given a sparsely populated neighborhood in North Omaha, a tight budget, and the high goal of achieving Zero Net Energy Ready. By using our tutelage, sharing our experience, and teaming up with architects, we did our best to achieve our goal. This project has been both challenging and rewarding. It tested our knowledge and pushed us past the bounds of conventional design to incorporate a multitude of sustainable methods and materials. The construction industry is moving toward increased collaboration and more sustainable practices. This project was a great outlet to display our ingenuity and education as well as follow the real world as we segue into the industry.

Compass-Zero Net Energy House

Michael Belford, Adam Myers

We created innovative ideas and strategies for a Department of Energy Zero Energy Ready Home.

SENIOR DESIGN PROJECTS

CONSTRUCTION MANAGEMENT/ARCHITECTURAL ENGINEERING
(THE DURHAM SCHOOL OF ARCHITECTURAL ENGINEERING & CONSTRUCTION)

http://cm.unl.edu | (402) 472-3742

ADVISOR TO ALL CM/AE TEAMS: TIM WENTZ

Habitat for Humanity - Omaha Race to Zero

Dillon Quackenbush, Addison Scheetz, Alex Hill, Nate Moulds

Designing a Zero Energy house for Habitat for Humanity-Omaha.

Habitat for Humanity Home Design

Lee Freudenburg, Ryan Pakes, Ryan Plager, Caitlin Tangeman, Madeline Horner

We are designing a home for Habitat for Humanity that will exceed Energy Star 3 requirements to become a Net-Zero Energy Ready home.

Race to Net-Zero Innovative Green Homes

Spencer Edwards, Chris Ciochon, Anna O'Neill, Hillary Krajnik, John Coughlin

Design/build a Net-Zero house. Senior Architects and Construction Management majors combined classes to work together on designing a self-sustaining house for Habitat for Humanity - Omaha. Challenges include meeting Net-Zero qualifications while designing the house and selecting the most economical products to build the house.

ELECTRICAL ENGINEERING

http://ece.unl.edu | (402) 472-3771

ADVISOR TO ALL TEAMS: MARK BAUER

Brain Controlled Car

Taylor Tvrdy, Nick Roth, Jacob Hanus, Michael Hackerott, Devin Larsen, Dakota Lindsey

We will construct a three-wheel car, which will be controlled via a Mindset EEG. The car will be controlled by the Mindset and automated in other ways. As of now, the Mindset will control the distance the car travels. All other functionality of the car will automate. The Mindset will communicate with a Raspberry Pi Linux PC via Bluetooth, which will then transmit data to an MSP430 microcontroller on the car.

Laser Engraving Photo Booth

Chris Haggart, Keith Murray, Garin Newcomb, Daniel Rogge, Tyler Troyer, Fernando Urias-Cordero

As a demonstration tool, a laser engraver includes many features that easily capture attention. The laser engraver produces a recognizable image that hopefully merits status as a keepsake. Our engraver is the central element of the "photo booth" that we have designed. A person can use the system's touchscreen interface to take a picture of themselves. The picture is then displayed on the screen, allowing them to choose if they wish to engrave the image or retake it. Once the image is to their liking, it is processed and converted to a silhouette version. This vastly decreases the amount of time required to engrave, while maintaining the image's recognizability. Once the image is prepared, a high-power laser is positioned over a business card-sized block of wood by a two-axis system of motors. These motors sequentially move the laser over each pixel in the image, and the laser is turned on, producing a pixel-sized burn mark on the surface of the wood. Once the image is completed, the user will be able to take it home.

Electrical Engineering - CONTINUED

Singing Tesla Coil with Laser Harp Control

Austin Riffle, Tyler Spellman, Faisal Ali, Faisal Altenaji, Joel Banninga, Mirzo Mirzokarimov

Our Tesla coil will play frequencies based on commands sent to it by a musical instrument. The musical instrument is a custom-designed laser harp with eight laser beams. Each beam being broken will send a corresponding pitch message to the Tesla coil to be played.

Intelligent Laptop Holder

Dongqi Lai, Dingyi Hong, Wenda Luo, Ammar Alraeesi

When people have to move around over some distance, many will have a need to use a personal computer (PC) or other monitors at the same time without carrying them by hands. Our project is designing a device that can carry a PC on it and recognize the followed person and perceive the movement.

Electric Skateboard

Spencer Anderson, Nicholas Pease, Mike Mozer,
Tim Leiferman, Joseph Hartwig

Our senior design project for electrical engineering is designing and building an Electric Skateboard. A direct-current, brushless motor is used to drive the skateboard in both the forward and reverse directions. The rider will stand on the skateboard and hold a wireless controller. This controller will have a joystick that is used as speed input. The desired speed is then sent wirelessly through a transmitter/receiver pair and used to drive the motor.

We designed the motor driver circuit to take waveforms from the microcontroller and generate the three-phase input to the motor. The motor will be driven at 33.3 volts DC and is rated for 2,750 watts and 80 amps. In order to meet the requirements for power, we are using three 11.1-volt batteries. The motor-driver circuit will direct the power from the batteries to the motor.

In order to better control the motor, we need some type of motor-speed feedback for our control system. To accomplish this, we are implementing three hall effect sensors and a magnet on the motor. The hall effect sensors detect when they are in the presence of this magnet and can be used to pinpoint how fast the motor is turning.

Our goal for this project is to carry a human rider weighing up to 250 pounds at 7 meters per second. At this weight, we wish to produce a maximum acceleration of 2 meters per second squared. Additionally, we wish to allow this skateboard to travel about 5 miles on one charge.

MECHANICAL ENGINEERING

http://mme.unl.edu | (402) 472-2371

Development of a Closed-Loop Peritoneal Membrane Oxygenator

Kayla Kampschneider, Chris Hodges, Nathaniel Stahr
ADVISOR: DR. BENJAMIN TERRY

This project is part of a larger initiative by NASA to develop a safer and less complex method of treating diminished lung function in space and low-earth orbit. Currently, mechanical ventilation and ECMO carry major risks when used in space, due to the usage of pure oxygen which, combined with the zero-gravity and enclosed environments, can lead to endangerment of the crew. Therefore, NASA has determined that for any deep-space exploration missions, there needs to be a method that will allow for the treatment of ARDS or a similar respiratory condition without endangering any crew member. Currently at UNL, research is underway using the design of lipid-shelled oxygen microbubbles (OMBs) as a safe way to deliver supplemental oxygen to the patient. The goal of this project is to design and implement a method to safely and effectively deliver OMBs continuously and over a longer period of time to live rats that have ARDS. This will provide information on the effectiveness and amount of OMBs continuously needed to treat varying levels of lung failure. This design is constrained by the need to keep the OMBs cool prior to use and heated to body temperature when administered to the patient. The device will be able to simultaneously provide a continuous flow of the OMBs to four different rats, with the possibility of higher numbers in the future. Based on the results of this study, OMBs could potentially be used for other respiratory disorders for patients on Earth.

Forming Pin Station Redesign

Joe Farley, John Jasa, Jennifer Markt, Rob Lemme
ADVISOR: WILLIAM DICK

BD requested a redesign of its existing forming pin station on a glass syringe assembly line. Current methods of operation caused downtime and loss of product since the forming pin needs to be changed every 30 minutes. During a pin change, the station must be disengaged. We have employed a dual-shaft system, which allows operators to switch out the forming pin and shaft assembly in a few seconds instead of keeping the station disengaged for 15-45 seconds while performing a pin switch with a single-shaft system. This station holds very tight tolerances. Consistent forming pin location must be verified if an interchangeable part system were to be used. The current station secures the shaft via elastomer. By employing a robust and improved shaft locking mechanism, the precision of the pin location can be enhanced, and operator ergonomics during a pin change can be improved.

Mechanical Engineering - CONTINUED

Municipal Solid Waste Borehole Shear Device

Nathaniel Matz, Ryan Newsham, Mary Pistillo
ADVISOR: WILLIAM DICK

The senior design team developed a borehole shear device for in-situ (in-ground) municipal solid waste testing to measure the strength of waste in landfills. The Nebraska Department of Environmental Quality mandates that land-based waste disposal and containment structures must demonstrate that engineering measures have been taken to ensure the reliability of the containment system. Furthermore, safely increasing capacity of existing landfills by vertical expansion depends on accurate predictions of the shear strength of the waste to avoid landfill failures, massive landslides. The Municipal Solid Waste Borehole Shear Device allows direct measurement of the waste compressibility and shear strength in-situ versus measurements of the past that were back-calculated from landfill failures and found in ex-situ testing in laboratories. The device is lowered into large boreholes (36 inches in diameter) that are drilled in landfills to install methane gas extraction systems. The device operates at a maximum of 100 feet below the ground surface and in a methane-concentrated, flammable environment. Utilizing hydraulic power and the mechanical advantage of a linkage system, the device applies a normal force against the borehole wall reaching a maximum of 10,000 pounds per square foot. It then applies a shear force generated from a motor and gear train with a maximum torque of 1,500 pound-feet. The compressibility and shear strength of the waste is measured, and a relationship between the two is developed.

Crimper

Deborah Burns, Micah Collison, Matt Newman

We developed an agricultural crimper used to terminate winter small grains at the flowering stage. This will create a mulch to suppress weeds. Crimping at three or four spots on the small grain stock will stop water flow and kill the plant if it is flowering. Crops will be planted either into the standing small grain less than a week before crimping, or will be no-till planted immediately into the crimped mulch.

ENGINEERING DEGREE OFFERINGS

The College of Engineering offers a wide range of undergraduate and graduate programs. Nebraska Engineering offers programs on three campuses in two major cities: (L) Lincoln - City Campus and East Campus; (O) Omaha - The Peter Kiewit Institute.

UNDERGRADUATE MAJORS (B.S.)

Agricultural Engineering (L-East)
Architectural Engineering (O)
Biological Systems Engineering (L-East)
Chemical Engineering (L)
Civil Engineering (L) (O)
Computer Engineering (L) (O)
Construction Management (L) (O)
Construction Engineering (L) (O)
Electrical Engineering (L) (O)
Electronics Engineering (O)
Mechanical Engineering (L)

GRADUATE PROGRAMS

Doctor of Philosophy (Ph.D.)

Biological Systems Engineering
Architectural Engineering
Biomedical Engineering
Chemical & Biomolecular Engineering
Civil Engineering
Computer Engineering (L)
Computer Engineering (O)
Construction Specialization
Electrical Engineering
Materials Engineering
Mechanical Engineering & Applied Mechanics

Master of Architectural Engineering (MAE)

Architectural Engineering

Master of Engineering Management (M.E.M.)

Engineering Management (online)

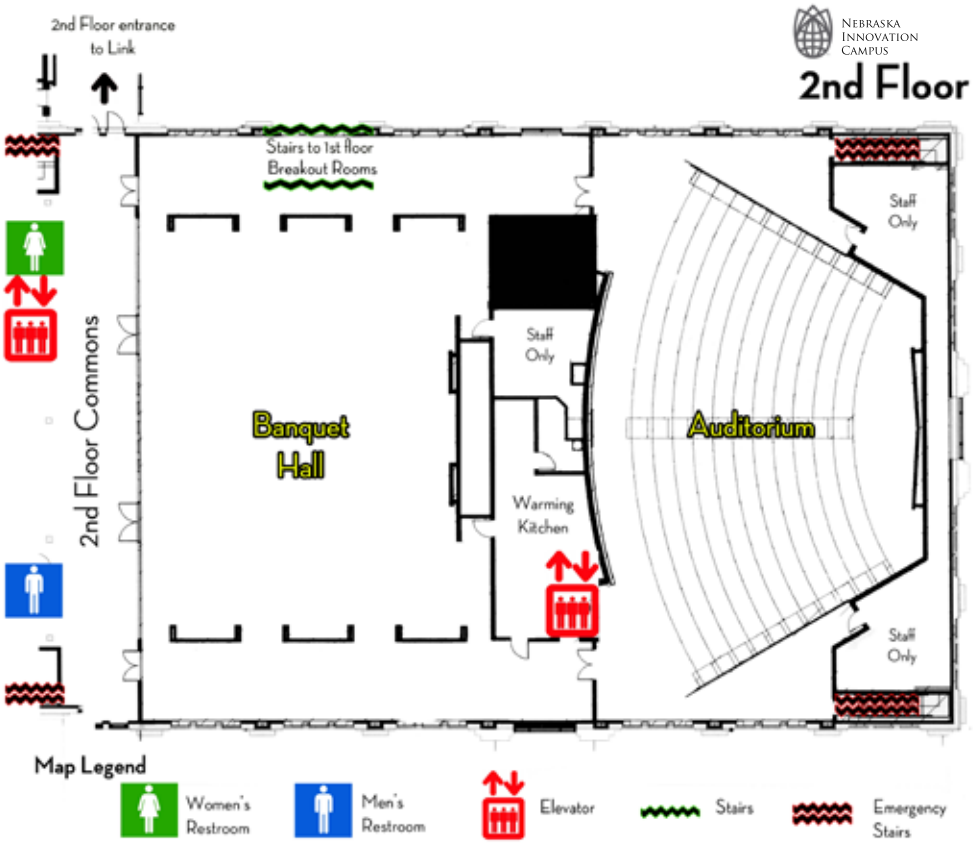
Dual Masters Programs

Engineering Mechanics and Materials Engineering (EMME)
Mechanical Engineering and Materials Engineering (MEME)

Master of Science (M.S.)

Agricultural & Biological Systems Engineering
Architectural Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Construction Engineering & Management
Electrical Engineering
Engineering Mechanics
Environmental Engineering
Mechanical Engineering
Mechanical Engineering & Applied Mechanics
Telecommunications Engineering


Nebraska Innovation Campus
1st Floor
Link to parking and Entrance
North entrance
Stairs to auditorium and Banquet hall
110.1 A1
110.2 A2
110.3 A3
118 D
STAFF ONLY
Warming Kitchen
NIC STAFF ONLY
112.2 B2
112.2 B2
112.3 B3
120 C
Caterers Elevator
STAFF ONLY
Innovation Studio
1st Floor Commons
South entrance
Map Legend
Women's Restroom
Men's Restroom
Elevator
Stairs
Emergency Stairs


2nd Floor entrance to Link
Nebraska Innovation Campus
2nd Floor
Stairs to 1st floor Breakout Rooms
Staff Only
Staff Only
Staff Only
2nd Floor Commons
Banquet Hall
Auditorium
Warming Kitchen
Map Legend
Women's Restroom
Men's Restroom
Elevator
Stairs
Emergency Stairs