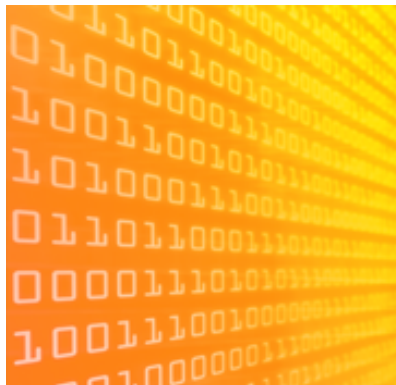




College of Engineering
TEMPLE UNIVERSITY®

Senior Design Day:
Final Presentations, Posters and
Demonstrations

April 12, 2012



Welcome to Senior Design Day, Spring 2012

Senior design is an important capstone design experience for undergraduate engineers. At Temple University's College of Engineering, we offer a multidisciplinary senior design experience. Students across the college participate in a college-wide design experience. Design teams are encouraged to include members from other departments so that our students learn how to collaborate with the different disciplines. Engineering today is a highly multidisciplinary field, and Temple emphasizes this throughout our undergraduate curriculum.

Senior design students participate in a two-semester design course. Projects are selected and approved by faculty before they enter Senior Design. The first semester consists of design and simulation of a project. The major deliverable for this course is a final presentation that describes and justifies the proposed design. Projects identify 10 major design constraints and must convince the review panel that the proposed design meets these constraints.

The second semester typically involves implementation and testing of the proposed project. A major deliverable for this portion of the course is a final presentation and poster that analyzes the project with respect to the major design constraints established in the first semester. Students are expected to demonstrate their projects on Senior Design Day.

Projects must address technical issues, such as performance and function, and practical issues such as cost and sustainability. Engineering systems to simultaneously satisfy these often competing concerns is an important part of modern engineering. At Temple, we emphasize a design process that integrates all such concerns into a single unified framework. We encourage industry involvement and are always interested in collaborating with industry on these projects.

This semester we have several teams that are doing projects with significant commercial appeal, including one project (Banner Bikes) that is competing in the Fox School of Business and Management Be Your Own Boss competition. We have also increased the overall number of projects involved in external competitions and should have a number of strong submission that will reflect well on Temple.

We hope you will enjoy the presentations and posters today. For further information on how you can get involved in senior design, please contact Joseph Picone (tel: 215-204-4841; email: picone@temple.edu).

Best regards,

The Senior Design Coordinating Committee:

Richard Cohen
Fatehy El-Turky
Joseph Picone
Robert Ryan

Presentation Schedule

Time	Dr. Cohen	Dr. Ryan	Dr. El-Turky / Dr. Darvish	Dr. Picone	Posters	
	EA 304	EA 305	EA 308	EA 311	EA SEL	
11:00 AM	SD1-05	SD1-01	SD1-02	SD1-04	A L L G R O U P S	
11:20 AM	SD1-09	SD1-07	SD1-03	SD1-10		
11:40 AM	SD1-06	SD1-08	SD2-01	SD1-13		
12:00 PM	SD1-12	SD1-11	SD2-05	SD1-14		
12:20 PM	BREAK					
12:40 PM	BREAK					
1:00 PM	SD2-06	SD2-04	SD2-08	SD2-03		
1:20 PM	SD2-24	SD2-07	SD2-10	SD2-18		
1:40 PM	SD2-02	SD2-09	SD2-12	SD2-19		
2:00 PM	SD2-13	SD2-17	SD2-14	SD2-31		
2:20 PM	BREAK					
2:40 PM	BREAK					
3:00 PM	SD2-16	SD2-11	SD2-25	SD2-22		
3:20 PM	SD2-27	SD2-15	SD2-26	SD1-21		
3:40 PM	SD2-28	SD2-20	SD2-23	SD2-29		
4:20 PM	BREAK					
4:40 PM	BREAK					
5:00 PM	SELECTED SD II POSTERS (DIAMOND CLUB: RHOADES ROOM)					
5:20 PM						
5:40 PM						
6:00 PM						

Note: Presentations designated with an SD1 or SD2 are Senior Design I and Senior Design II presentations respectively.

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Course Coordinator: Dr. Richard Cohen

11:00 AM	SD1-05	Wheelchair Accessible Swing <i>Universal Playgrounds</i>
11:20 AM	SD1-09	Mechanical Handchime Player for the Disabled <i>Infinite Design Works</i>
11:40 AM	SD1-06	Rapid Mobile Durable Stretcher <i>Rapid Extraction Devices</i>
12:00 PM	SD1-12	Utilization of Waste Heat for Household Energy Cons. <i>Carnot Inc.</i>
POSTER SESSION (SEL)		
1:00 PM	SD2-06	NASA's 2012 Lunabotics Mining Competition <i>Temple Lunabotics I</i>
1:20 PM	SD2-24	Enhanced Stormwater Drainage System <i>Hydro Sustainable Consultants</i>
1:40 PM	SD2-02	2012 ASHRAE Competition, Mansueto Library <i>HVAC Innovations</i>
2:00 PM	SD2-13	Modernizing the Water Wheel <i>River Power</i>
POSTER SESSION (SEL)		
3:00 PM	SD2-16	Human Powered Vehicle <i>HPVC</i>
3:20 PM	SD2-27	Disney ImagiNations Design Competition <i>Forward Thinking</i>
3:40 PM	SD2-28	Lithium-ion Battery Thermal Management System <i>DDL, Inc.</i>

Room Schedule: EA 305

Course Coordinator: Dr. Robert Ryan

11:00 AM	SD1-01	ASCE Timber Bridge Competition <i>Temple Timber Designs</i>
11:20 AM	SD1-07	Optimizing Efficiency of a Hydro Turbine <i>Hydro Capture</i>
11:40 AM	SD1-08	Green Roofing Using Recycled Material <i>Revolutionary Urban Green Roofing Inc.</i>
12:00 PM	SD1-11	Pedestrian Easy Access Bridge <i>United Nations, Inc.</i>
POSTER SESSION (SEL)		
1:00 PM	SD2-04	Treatment of Drinking Water Using Polymeric Sorbents <i>Clean Water Ventures</i>
1:20 PM	SD2-07	Sustainable and Efficient Rope Pump Design <i>Thirst Quenchers, Inc.</i>
1:40 PM	SD2-09	ASCE/AISC Steel Bridge Competition <i>Steel Bridges, Inc. (I)</i>
2:00 PM	SD2-17	2012 ASCE/AISC Student Steel Bridge Competition <i>Steel Bridge, Inc. (II)</i>
POSTER SESSION (SEL)		
3:00 PM	SD2-11	2012 ASCE Concrete Canoe Competition <i>King of the Sea</i>
3:20 PM	SD2-15	Design and Maturity Testing of Rigid Sidewalk <i>Concrete Innovation</i>
3:40 PM	SD2-20	Stormwater Detention Tank <i>Stormwater Solutions</i>

Room Schedule: EA 308

**Course Coordinators: Drs. Fatehy El-Turky
and Kurosh Darvish**

11:00 AM	SD1-02	Solar Powered Water Purification System <i>Electric Water</i>
11:20 AM	SD1-03	Wireless Fire Alert System <i>Firefighters Inc.</i>
11:40 AM	SD2-01	High Voltage Switch Mode Power Supply <i>SIPA</i>
12:00 PM	SD2-05	AC/AC Converter for Wind Turbine <i>AC, Inc.</i>
POSTER SESSION (SEL)		
1:00 PM	SD2-08	Acquiring and Wirelessly Transmitting EMG Signals <i>Muscle Controllers</i>
1:20 PM	SD2-10	Small Scale EV Charging Station with VAR Compensation <i>Next Level Charging</i>
1:40 PM	SD2-12	NASA Lunabotics Mining Competition <i>High CLASS</i>
2:00 PM	SD2-14	Near Space Biological Acquisition Unit <i>RockSat 2012</i>
POSTER SESSION (SEL)		
3:00 PM	SD2-25	TUBUV: Designing a Basic Utility Vehicle <i>Engineering For A Third World Future</i>
3:20 PM	SD2-26	Greywater/Rainwater Recovery System for Water Reuse <i>Every Drop Counts, Inc.</i>
3:40 PM	SD2-23	Testing of Brain Injury with Shocktube <i>Rat Pack Engineering</i>

Room Schedule: EA 311

Course Coordinator: Dr. Joseph Picone

11:00 AM	SD1-04	Formula SAE Vehicle Enhancement <i>The Drifters</i>
11:20 AM	SD1-10	Optimized Performance: Hybrid-Electric Drivetrain <i>Dragging Turtle</i>
11:40 AM	SD1-13	Automated Drum Head Frequency Tuner <i>Drum_Ware</i>
12:00 PM	SD1-14	Microcontroller-based Electrical Engineering Workbench <i>Simple Incorporated</i>
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1:00 PM	SD2-03	Industrial Composite Support Structure <i>The Dynamic Space Duo</i>
1:20 PM	SD2-18	Digital Communications Device for Divers <i>Aquatic Acquisition</i>
1:40 PM	SD2-19	Hydro Turbine Generator <i>Green Flow Engineering</i>
2:00 PM	SD2-31	Parking Lot Stormwater Harvesting <i>Dima Engineering</i>
POSTER SESSION (SEL)		
3:00 PM	SD2-22	A Pedal Electric Hybrid Bicycle <i>Banner Bikes</i>
3:20 PM	SD2-21	Ultrasonic Detection for the Blind/Visually Impaired <i>Eyes for the Blind, Inc.</i>
3:40 PM	SD2-29	Modeling of Small-Scale Wastewater Treatment System <i>Wasteworks</i>

Senior Design I:

... To design, simulate and prototype ...

“Simplicity is the ultimate sophistication.”

Leonardo da Vinci, circa 1475

Team SD1-01	Temple Timber Designs	EA 305 11:00 AM
Team Members	John Boehm, Robert Hayes, Greg Michalski and Adam Oberholtzer	
Advisor(s)	Dr. Felix Udoeyo	
Coordinator	Dr. Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	ASCE Timber Bridge Competition	
Abstract	<p>The American Society of Civil Engineers (ASCE) and Forestry Products Society (FPS) National Timber Bridge Design Competition is a nationally recognized engineering competition in which students must design and construct a timber bridge to the criteria set forth by a panel of judges. The purpose of this competition is to bring attention to the multitude of deficient bridges in rural America and to present timber bridges as an economical solution. Many bridges that are vital to the infrastructure of rural America are nearly unusable and many times out of commission. This is detrimental to the general public that lives in these areas and also to local industries such as agricultural and logging operations that rely on the local infrastructure to ship their products. A timber design for short spans, as is common with rural bridges, is more economical than steel or concrete in most situations and also keeps the rustic look that so many citizens love about the rural roads in America. The objective of our project is to build a pedestrian scale model bridge to enter in the National Timber Bridge Design Competition that may be evaluated and expanded for roadway use in the future. Our bridge will be at a minimum 3.8 meters long and 1.4 meters wide. It must withstand 20 kN of force for a duration of 1 hour. While loaded with the 20 kN load the bridge beams may not deflect more than 9mm. The overall design must also be practical, well supported, and innovative to be successful in the competition.</p>	
URL	https://sites.google.com/a/temple.edu/timberbridge/	

Team SD1-02	Electric Water	EA 308 11:00AM
Team Members	Ibrahima Coulibaly, Nyebeju Kpodi, Bhaarat Patel and R. Conor Power	
Advisor(s)	Saroj K. Biswas	
Coordinator	Fatehy El-Turky	
Department(s)	Civil and Environmental / Electrical and Computer / Mechanical	
Project Title	Solar Powered Water Purification System	
Abstract	<p>The lack of clean drinking water is a problem that plagues many third world countries, disaster areas, and even developed countries. Approximately 884 million people suffer each day from the lack of proper drinking water. Most of the current technologies available to combat the problem are expensive and consume too much power to be effective in rural regions of the planet. The solutions that do not consume an excess of power generally require expensive and time consuming filter maintenance. Affordable chemical processing mechanisms have been known to be hazardous if used improperly. With the idea of low cost and sustainability in mind, we plan to develop a water filtration system that will take advantage of natural energy in order to power a water filtration system. A manual water input flows through a carbon filter and then is processed through a UV tank. By using both standard Carbon filtering and ultraviolet radiation to purify the water our goal is to have 95% of Total Coliform removed. The purified water will then empty into a reserve tank. In order to save on energy and cut cost down, the water will be hand fed in to the system and will rely on top down gravity, rather than pump action. We plan to use photovoltaic technology to transform sun rays to electric potential that will be stored in a battery backup system. This battery system will power the ultraviolet purification process of the system.</p>	
URL	https://sites.google.com/a/temple.edu/solar-power-water-purification-system/	

Team SD1-03	Firefighters Inc.	EA 308 11:20 AM
Team Members	Erhan Aydin, Youssef Jaber, Amos Kabui and Jasminkumar Patel	
Advisor(s)	Fatehy El-Turky	
Coordinator	Fatehy El-Turky	
Department(s)	Electrical and Computer Engineering	
Project Title	Wireless Fire Alert System	
Abstract	<p>According to the National Fire Protection Association (NFPA) website, "In 2010, there were 1,331,500 fires reported in the United States. These fires caused 3,120 civilian deaths, 17,720 civilian injuries, and \$11.6 billion in property damage. It is also estimated that in the United States a fire department responds to a fire every 24 seconds ". Looking at these statistics we see that fires in homes and buildings are a part of our daily lives. To solve the problems caused by the fires, several safety measures have been put in to place to reduce the number of fatalities and losses. Some of the commonly used safety devices today are fire alert systems and smoke detectors.</p> <p>Many homes and buildings today have a fire alarm system or smoke detectors that alert the occupants when there is fire. The fire alarms systems alert the occupants of a building by sounding an alarm which is loud enough for everyone in the building to hear in order to evacuate. These alarm systems are effective only if the fire alarm can be heard; otherwise if no one is near the home or building, the fire or smoke in the building would go unnoticed. The other major problem created by fire is that it takes the fire department a long time to determine which rooms are occupied and which rooms to extinguish the fire first. Our project differs from the existing systems by being able to send a map of the house to the fire department, showing live update of the occupied rooms in the house, and the rooms that are on fire to the fire department even before they get to the scene of fire.</p>	
URL	https://sites.google.com/a/temple.edu/wirelessfirealarm/	

Team SD1-04	The Drifters	EA 311 11:00 AM
Team Members	Mohammad AlSaffar, Nikhil Patel, Stephen Rzucidlo and Tin Lai	
Advisor(s)	Richard Cohen	
Coordinator	Joseph Picone	
Department(s)	Electrical and Computer / Mechanical Engineering	
Project Title	Formula SAE Vehicle Enhancement	
Abstract	<p>One of the main components of a formula SAE vehicle is its engine management system, which controls fuel injection, torque and other parameters of an engine along with its sensors. Formula SAE vehicles built by different universities compete every year by overcoming challenges in endurance and speed. Engine management systems acquire inputs from various sensors of the vehicle, using these inputs an output is given as a response. The objective of our design for an engine management system will be to optimize Temple University's Yamaha R6 engine to run smoothly while achieving max speed using a 14.7:1 air/fuel ratio. The design will include the wiring and programming of a compatible micro controller to the various engine components ranging from sensors to fuel injection. The micro controller will then respond to inputs being given by performing tasks for that parameter using a 0-5V input range taken from the sensors. To obtain the most efficient results, calculations and testing will be done for each of the components wired to the system. The system will also be cheaper and smaller compared to competitors by costing less than \$600, having dimensions of 5" x 6" x 1.0", and weighting less than 1kg.</p>	
URL	https://sites.google.com/a/temple.edu/formula-sae-vehicle-enhancement/	

Team SD1-05	Universal Playgrounds	EA 304 11:00 AM
Team Members	Mark Eckert, Matthew Galica, Liam Shea, and Scott Tillaman	
Advisor(s)	Kurosh Darvish	
Coordinator	Dr. Richard S. Cohen	
Department(s)	Mechanical Engineering	
Project Title	Wheel-chair Accessible Swing	
Abstract	<p>Playgrounds have been an invaluable tool in the healthy development of children, both physically and socially, for over a century. Social skills that children develop on the playground become skill sets that will be drawn on throughout their lives. Unfortunately, many disabled children with special needs are unable to interact with playgrounds in the same manner as typical children. Our project is focused on designing a universally accessible playground that meets both the physical and stimulation requirements for a diverse group of children. We further plan to develop an individually operated, wheelchair accessible, swing that will serve as the focal piece in both our project and playground design. Our hopes are that the development of a universally accessible playground will not only allow disabled children to interact with the equipment, but with other children at the playground, helping to foster an inclusive and socially stimulating experience for all. We also hope that operating our swing will help build strength and confidence in wheelchair bound individuals.</p>	
URL	https://sites.google.com/a/temple.edu/universal-playgrounds/home	

Team SD1-06	Rapid Extraction Devices	EA 304 11:40 AM
Team Members	Nathan Wagenhoffer, Neel D. Patel and Ronald Price	
Advisor(s)	Gaetano Restivo	
Coordinator	Joseph Picone	
Department(s)	Mechanical Engineering	
Project Title	Rapid Mobile Durable Stretcher	
Abstract	<p>The military relies on the best equipment when it comes to modern medicine, especially when it comes to field rescues. Rescuers are often under great threat and need a faster tool that enables them to quickly load and carry wounded personnel. The existing medical stretcher is too heavy, large, difficult to carry, utilizes slow and unreliable securing straps, and takes too long to setup.</p> <p>We propose to design a more effective stretcher for use in combat zones. There are nine technical requirements that we will try to accomplish within the design. The design must be collapsible, weigh less than 8 pounds, support up to 400 pounds. The stretcher must be able to be setup, have the injured person onto the stretcher, and secured in less than 15 seconds. The design must incorporate a mechanism to allow for attachment to a helicopter's hoist rope. All joints and locking mechanisms must be able to withstand operational bumps and vibrations. The design must be able to safely transport an injured person across rough terrain, while also minimizing wear. Finally, the stretcher will be designed for use and transportation by a single person.</p>	
URL	https://sites.google.com/a/temple.edu/rapid-extraction-devices	

Team SD1-07	Hydro Capture	EA 305 11:20 AM
Team Members	Gagandeep Dhillon, Marshall Feaster, Matthew May and Mohamed Taieb	
Advisor(s)	Dr. Robert Ryan, Dr. Shriram Pillapakkam	
Coordinator	Dr. Robert Ryan	
Department(s)	Civil and Environmental / Mechanical Engineering	
Project Title	Optimizing Efficiency of a Hydro Turbine	
Abstract	<p>As the production of electricity continues to increase the amount of greenhouse gasses affecting our atmosphere, clean energy sources such as a hydro-electric power will help diminish some of the negative consequences of carbon emission. Low efficiency, however, is a legitimate criticism aimed at clean energy production. Improving that efficiency is a large challenge facing engineers today.</p> <p>Our project is to design a convergent / divergent duct to optimize the efficiency of a hydro turbine. The theory of design will be based off of the continuity equation by incorporating a duct system that will increase the velocity of fluid flowing past an Ampair UW100 water turbine. The design will introduce a vortex tunnel to decrease turbulence in the converging and diverging sectors. The system will be positioned at the appropriate depth by using a two point anchoring system and a supporting buoy. At the inlet and outlet ports, a mesh guard will protect the turbine from foreign objects and provide a safer environment for any wildlife. The goal of the project is to exceed the daily output of prior senior design teams who worked with the same turbine, but took a different design approach.</p>	
URL	https://sites.google.com/a/temple.edu/hydrocapture/	

Team SD1-08	Revolutionary Urban Green Roofing Inc.	EA 305 11:40 AM
Team Members	Monica Lyv, Samantha Patron, Alexandria Slater-Williams and Linh Truong	
Advisor(s)	William Miller	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	Green Roofing Using Recycled Material	
Abstract	<p>A living green roof is a system that utilizes vegetation on the rooftops of urban buildings. Having a green roof reduces stormwater run-off and loads on combined sewer systems (CSS). This trait is essential for city environments that generally consist of concrete and asphalt, materials that are impermeable and heat absorbent. Green roofing also decreases the amount of solar radiation on rooftops, resulting in significant cooling effects. The replacement of two typical layers with recycled material will make green roofs more sustainable. Ceramic will be used as a drainage layer, and wool carpet underpad will be used as the absorbent layer. On the roof of Temple University's Engineering Building, our goal is to address this idea by designing four 2'X2' models, and one control (non-vegetative model) to test the effects of the ceramic drainage layer and carpet underpad. Remote heat sensors will be used to monitor the vegetated system's effects on the roof. From the data, we will study energy conservation, the reduced volume of stormwater runoff, and the mitigation of the impervious surface runoff effects. Our green roof consisting of recycled materials will revolutionize the standards of contemporary green roofs.</p>	
URL	https://sites.google.com/a/temple.edu/slam/	

Team SD1-09	Infinite Design Works	EA 304 11:20 AM
Team Members	Binu Mathew and Kenneth Mosley	
Advisor(s)	Kurosh Darvish	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	Mechanical Handchime Player for the Disabled	
Abstract	<p>This project will involve the design and implementation of a mechanical device that will enable a person with a limiting physical disability to play a handchime. The device will utilize a trigger mechanism that will be activated after a defined vertical displacement of the pedal takes place, releasing a striker from a stationary position to collide with a handchime. The collision will achieve the desired sound after which the release of the pedal will bring the striker back into stationary position and the process will repeat. A system of adjustable shocks will be positioned between the horizontal plate and the base of the device which will allow for variation of resistance to the striking force applied. The adjustable shocks will make it possible to tailor the instrument to a specific striking force, allowing for therapeutic exercises that have been understood as beneficial to individuals with physical disabilities.</p>	
URL	https://sites.google.com/a/temple.edu/infinite-design-works/	

Team SD1-10	Dragging Turtle	EA 311 11:20 AM
Team Members	Mbalu Fornah-Delo , Charles Saunders, Hategou Kpanougou and Charles Jackson	
Advisor(s)	Dr. Richard S. Cohen	
Coordinator	Dr. Joseph Picone	
Department(s)	Civil and Environmental / Electrical and Computer / Mechanical	
Project Title	Optimized Performance: Parallel Hybrid-Electric Drivetrain	
Abstract	<p>One of the many ways a vehicle performance can be improved is by changing or adjusting the vehicle's drivetrain to either increase fuel performance, speed or both. Previously competing in several Formula SAE races, the drivetrain used in the Temple University Formula SAE race car has not performed well enough for the owls to rank in any of the competitions. The first design goal is to determine a hybrid-electric method and configuration to use in the redesigning of the current TU Formula SAE vehicles' drivetrain, to meet the 2012 Formula Hybrid competition rules.</p> <p>Our goal is to design a drivetrain that will increase performance by fifty percent in comparison to 2011 winner in each event from the last two Formula Hybrid competitions. We plan to increase the performance of the Temple University Formula SAE racecar by implementing another power source; also recalculate the gear ratio used for our transmission. Proper testing will be conducted by using two different methods; first creating a racecar prototype testing the performance level. Finally we'll measure the power sources performance level with the Temple University's Chapter of SAE Dyno.</p>	
URL	https://sites.google.com/a/temple.edu/dragging_turtle	

Team SD1-11	United Nations, Inc.	EA 305 12:00 PM
Team Members	Zenas Walelo, Nahome Menker, Sk Hossain and Denzel Golden	
Advisor	Dr. William Miller	
Coordinator	Dr. Robert Ryan	
Department	Civil and Environmental Engineering	
Project Title	Pedestrian Easy Access Bridge	
Abstract	<p>As the population on Temple University's main campus increase, so does the potential for accident on the 12 Street and Pollet walk intersection in particular, which is quickly becoming the center of campus as Temple increases its borders. The intersection is virtually the epicenter of pedestrian traffic during rush hour. United Nation, Inc. will address this problem by designing a pedestrian bridge that will span the length of the intersection. This will allow pedestrians to cross the street without the fear of being hit by oncoming traffic. Drivers will also have the benefit of a pedestrian free intersection. The project will be validated through testing the model of the bridge, which will be created using the STAAD.Pro software. This model will be tested rigorously to ensure the safety of the pedestrians and the drivers affected. Passing these test and meeting all standard will result in delivering digital model of the Pedestrian Elevation Access Bridge, created using the STAAD Pro Software and blueprint of the bridge so that it is able to be created.</p>	
URL	https://sites.google.com/a/temple.edu/pedestrian-bridge/	

Team SD1-12	Carnot Inc.	EA 304 12:00 PM
Team Members	Michael Barretta, Dennis Crawford, David Eber and Michael Harbove	
Advisor(s)	Vallorie Peridier	
Coordinator	Richard Cohen	
Department(s)	Civil and Environmental / Mechanical	
Project Title	Utilization of Waste Heat for Household Energy Conservation	
Abstract	<p>In today's energy conscious society, reducing the cost of utilities has become a matter of utmost importance. Many of the appliances used today to provide comfort in the home tend to generate excessive amounts of waste heat. The main goal of Carnot Inc. is to develop an integrated system that supplies the waste heat generated by the refrigeration cycle of a commercial dehumidifier to a hot water heater. This will be accomplished by redirecting the refrigerant condenser coils within the dehumidifier into a heat exchanger connected to the cool water intake of the water heater. The focus of this design will be to demonstrate a prototype dehumidifier/water heater whose maintainability and cost of installation can compete with those of existing water heater designs, with highly improved efficiency. The design will utilize off the shelf components in order to minimize cost and provide a competitive marketing price. The integrated systems increased efficiency should recoup any initial costs in a timely manner, further increasing the systems marketability. Carnot Inc. is dedicated to developing a prototype hybrid water heating system that will ultimately help replace the energy consuming water heaters in widespread use today.</p>	
URL	https://sites.google.com/a/temple.edu/utilization-of-waste-heat-for-energy-conservation/	

Team SD1-13	Drum_Ware	EA 311 11:40 AM
Team Members	Fabien Tenaud, Kazeem Animasaun and Joy Wilson	
Advisor(s)	Joseph Picone	
Coordinator	Joseph Picone	
Department(s)	Civil and Environmental / Mechanical	
Project Title	Automated Drum Head Frequency Tuner	
Abstract	<p>Drums are musical instruments, just like guitars they have notes which emit when played. The problem we are addressing is the complexity behind tuning these intricate instruments. The skin of a drum is tightened at 4, 6 or 8 points (lugs) around the shell. With 8 variables acting on one another, the average frequency emitted from skin is tough to be controlled. We are proposing to create a device which, using an infrared laser will be able to record the frequency emitted at each individual lug. The laser will point down on the skin of the drum at an angle, $\sim .5^\circ$ away from the edge of the shell. It will then reflect back up to infrared sensitive photo gate which will record the displacement of the laser due to a change in the reflection angle from the skin vibrating up and down. With a time keeping device, we will derive the data to get an accurate reading of the differing frequencies. With this data, a servomotor will be connected each lug and will tighten or loosen accordingly. To validate a clear harmonious note, a microphone will record the general frequency of the drum at the end of each tuning cycle.</p>	
URL	https://sites.google.com/a/temple.edu/drum_ware/	

Team SD1-14	Simple Incorporated	EA 311 12:00 PM
Team Members	David Gould, Alpha Kamara and Matt Mohr	
Advisor(s)	Fatehy El-Turky, Frank Ferrese	
Coordinator	Fatehy El-Turky	
Department(s)	Electrical and Computer Engineering	
Project Title	Microcontroller-based Electrical Engineering Workbench	
Abstract	<p>ECE students are required to use multiple devices in laboratories. These devices often include a waveform generator, a DC power supply, and a digital multimeter (DMM). We propose to build a lightweight, portable, all-in-one device to meet these needs, the Microcontroller based Electrical Engineering Workbench. The device will feature a variable DC power supply with two voltage rails, each ranging from 0.5 V to 15 V with an increment of 0.1V. The integrated waveform function generator will be capable of producing sine waves, square waves, and triangle waves with frequencies ranging from 1 Hz to 1 MHz. The device will also have a built-in digital multimeter, capable of measuring resistance, voltage, and current. The circuitry will be controlled by a microcontroller interfaced with an LCD capable of making selections.</p>	
URL	https://sites.google.com/a/temple.edu/variable-dc-power-supply	

Senior Design II:

...To fabricate, test, and optimize ...

**“Everything should be made as simple as possible,
but no simpler.”**

Albert Einstein, *On the Method of Theoretical Physics* (1933)

Team SD2-01	SIPA	EA 308 11:40 AM
Team Members	Philip Agbede, Izuchukwu Dike, Ajo Maret and Olushola Olatujoye	
Advisor(s)	Fatehy El-Turky	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer Engineering	
Project Title	High Voltage Switch Mode Power Supply for Three-Phase AC Aircraft Systems	
Abstract	<p>This project involves the design and implementation of a Three Phase Power Converter (AC/DC/AC). The designed system will convert an AC voltage of 110 Volt at 60Hz frequency to DC voltage by using a Diode Bridge Rectifier, and a capacitive filter which will help in stabilizing the output DC voltage that is produced. After that the system provides the gate drive signal to the three phase pulse width modulation (PWM) inverter. The pulse width modulation signal/code control algorithm will be developed in Matlab/Simulink/Real-time workshop using block diagram. The code generated in Matlab will be converted to C language by the real-time workshop (RTW) and then transferred to the DSP board by using the code composer studio (CCS). The Three Phase IGBT (insulated Gate Bipolar Transistor) uses the DC voltage produced by the diode bridge rectifier and the gate driver signal to produce a sinusoidal AC output. An inductive and a capacitive (LC) filter will be designed to help produce a pure sinusoidal output waveform. The aim of this project is to implement a design that is capable of producing 10KW of power at 110 volt at output.</p>	
URL	https://sites.google.com/a/temple.edu/team-elect/	

Team SD2-02	HVAC Innovations	EA 308 11:00 AM
Team Members	John Bisacquino, Josh Dennis and Travis Westover	
Advisor(s)	Steve Ridenour	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	2012 ASHRAE Competition, Mansueto Library – University of Chicago	
Abstract	<p>At the University of Chicago, the newly opened Mansueto Library will be the focus of the 2012 ASHRAE Student Design Competition. The Library boasts the largest automated storage and retrieval system of any library in North America.</p> <p>Total floor area for the library is around 58,700 ft². The building consists of two floors. The large underground storage area extends 55 feet below ground and has the capacity to store approximately 3.5 million volumes. The ground floor sits underneath a glass dome encompassing the entire structure containing an 8000 ft² reading room, 6000 ft² preservation department, circulation center, and digital technology lab.</p> <p>Using Trane Trace 700 software, we will construct a model of the building and design an HVAC system compatible with the unique requirements of this structure. Our model will address storage environment requirements for preservation of archives along with user comfort for the ground floor area. HVAC system layout and component location will require special consideration to ensure architectural acceptability under the glass dome. Compliance with ASHRAE Standards 62.1-2007 (Ventilation for Acceptable Indoor Air Quality), 90.1-2007 (Energy Standard for Buildings), and 55-2004 (Thermal Comfort) will be included the design.</p>	
URL	https://sites.google.com/a/temple.edu/hvac-innovations	

Team SD2-03	The Dynamic Space Duo	EA 311 1:00 PM
Team Members	Jessica Graziano and Aleksandr Souk	
Advisor(s)	Joseph Picone	
Coordinator	Joseph Picone	
Department(s)	Electrical and Computer / Mechanical	
Project Title	Industrial Composite Support Structure	
Abstract	<p>Composite materials are becoming widely integrated into the aerospace industry due to unique mechanical and electrical properties. The lightweight molecular composition of these materials makes them ideal for equipment being sent into space. Housing supports, used in the aerospace industry for supporting different components of flight equipment, are made of these composite materials. In this specific case, the housing support will have a DC-to-DC converter attachment as a power supply for the flight equipment. We will fabricate, manufacture, and test the composite to ensure it fits within size restrictions, adds a minimum of 10% increase to toughness levels, and a 10% decrease in weight. The DC-to-DC converter attachment is a boost converter, meaning it provides an output voltage greater than its input. This type of converter is ideal because runs between 70% to 80% efficiency. It is being used to eliminate the need for an additional power supply by effectively operating with a maximum current of 100mA while inputting a voltage of 5V and outputting a voltage of 12V. The density of the circuit will also be reduced, resulting in a 30% decrease in size and weight.</p>	
URL	https://sites.google.com/a/temple.edu/industrial-housing-support-with-dc-to-dc-converter-attachment	

Team SD2-04	Clean Water Ventures	EA 305 1:00 PM
Team Members	Jenna Fink, Nicola Horscroft, Hasan Malik and Anthony Shields	
Advisor(s)	Judy Zhang	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	Treatment of Drinking Water Using Polymeric Sorbents	
Abstract	<p>Ongoing research suggests that the occurrence of pharmaceutical compounds in the environment has become a growing concern. Without a sufficient method of removing pharmaceutical compounds, there has been an increase in levels of antibiotics within our water systems. Research suggests that an accumulating level of antibiotics from human and animal wastes is widespread. Toxicity levels remain largely unknown but a cost effective treatment method must be developed should the pharmaceutical compounds prove to be hazardous.</p> <p>Our goal is to address this problem by using polymer sorbents that can cost effectively remove antibiotics from drinking water. Polymeric adsorbents work by adsorbing hydrophobic and hydrophilic molecules such as antibiotics from water using a high surface area with both continuous pore and polymer phases. Column experiments will be carried out to test the efficiency of the selected polymeric sorbents towards the removal of antibodies present in the water. The size, flow rate, capacity, and regeneration of the column will be designed to be cost effective while removing the maximum amount of potentially hazardous antibiotics. The final result is a small-scale model that can be scaled up for full-size drinking water treatment operations.</p>	
URL	https://sites.google.com/a/temple.edu/acwt	

Team SD2-05	AC, Inc.	EA 308 12:00 PM
Team Members	Aref Arhman, Gesner Gedeus, Edward Kraku and Mark McCauley	
Advisor(s)	Fatehy El-Turky	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer Engineering	
Project Title	AC/AC Converter for Wind Turbine	
Abstract	<p>The ever-increasing dependence on electronic devices which utilize AC power highlights the problems related with the loss of power from the electrical grid. In many places where the electrical infrastructure is not well-developed, brown-outs can prove fatal when electronic medical instruments become unusable. Therefore, there is a need for inexpensive and reliable pure-sine wave power source for use with medical devices in the underdeveloped world. Our objective is to design inexpensive AC-DC-AC converter that requires lower watts for a wind turbine uses. Wind turbine produce alternating current with different frequencies, we will convert the alternating current using three phase full bridge rectifier. Next, we will build half bridge inverter to convert the direct current to alternating current. By means of a micro controller, we will use pulse width modulation to get an output of 120VAC. Our design will consist of a regulated output sine wave with a total harmonic distortion less than 5 %, and possible efficiency of greater than 85%. We will test our system for 500 Watts for simulation purpose.</p>	
URL	https://sites.google.com/a/temple.edu/ac-inc	

Team SD2-06	Temple Lunabotics I	EA 304 1:00 PM
Team Members	Max Bustos, Philip Dupuis, Alexander Kaminsky and Dan Keeney	
Advisor(s)	John Helferty and Alex Pillapakkam	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	NASA's 2012 Lunabotics Mining Competition	
Abstract	<p>Temple's Lunabot, is a semi-autonomous excavator, being designed and constructed to compete in NASA's third annual Lunabotics Mining Competition taking place in May 2012. The aim of the student-based competition is to build an excavator that is capable of collecting simulated lunar regolith from the competition area and deposit the material into a collection bin.</p> <p>The robot will need to meet the mandatory constraints set by NASA which include an 80kg weight restriction, a 0.75(h)m*1.5m(w)*0.75m(l) size restriction, and the successful collection and deposition of at least 10kg of simulated regolith. The competition rules are based on a point system which reward and penalize the team according various functional parameters. The design group is also imposing additional constraints regarding the excavator's travel speed, collection/excavation rate, mass, and cost.</p> <p>Our design will be based off of successful designs from the previous competitions and from examples of real world excavation machinery. Excavation will be performed by a conveyor system collecting regolith in a hopper which will then be deposited in the collection bin via a dump-truck like movement. The drive system will consist of four wheels powered by high-efficiency electric motors. Materials for the Lunabot consist of composites, steel and aluminum. Solidworks was used for model construction and stress simulations.</p>	
URL	https://sites.google.com/a/temple.edu/lunabotics2011/	

Team SD2-07	Thirst Quenchers, Inc.	EA 305 1:20 PM
Team Members	Brian Davidson, Fiona Farrelly, Thomson Liang and Melissa MacKinnon	
Advisor(s)	Robert Ryan	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental / Mechanical	
Project Title	Sustainable and Efficient Rope Pump Design	
Abstract	<p>In this era of great technological growth, there are still people that do not have a readily available supply of one of the most basic of needs, water. The main goal of Thirst Quenchers Inc. is development of a Sustainable and Efficient Rope Pump that provides access to potable water in rural areas worldwide with a volumetric output of 45 Liters/minute. The rope pump is the ideal method to tap the obtainable resource of fresh groundwater. When compared to other existing methods it is the more reliable, sanitary, and cost effective option. The simple design and use of local materials provide sustainability because of the ability to be locally maintained. Features such as an anticorrosive coating and concrete well covering ensure both minimal structural deformations and prevent negative effects on existing water quality. With the typical users being women and children it is important that no energy input goes to waste. Therefore the hydraulic efficiency of 85% with a user input of 75 Watts is a highlight of the pumps design. Thirst Quenchers Inc. is confident that the proposed rope pump will have a significant impact on areas with limited to no potable water with the sustainable and efficient design.</p>	
URL	https://sites.google.com/a/temple.edu/rope-pump	

Team SD2-08	Muscle Controllers	EA 308 1:00 PM
Team Members	Paul Chedrawi, David Fitzgerald, Nabidur Rahman and Allison Tierney	
Advisor(s)	Iyad Obeid	
Coordinator	Joseph Picone	
Department(s)	Electrical and Computer Engineering	
Project Title	Acquiring and Wirelessly Transmitting EMG Signals	
Abstract	<p>Electromyography (EMG) is a method of capturing the electrical potential produced by contracting skeletal muscle tissue. However, current EMG acquisition systems require the use of wires which limit user mobility and convenience. Our objective is to collect these EMG signals wirelessly and transmit them to an Android OS based tablet for further analysis. We will design a sleeve containing EMG electrodes that the user will wear on their arm. The electrodes in the sleeve will detect muscle movements of the user, with a bluetooth transmitter wirelessly relaying the signals to an Android Tablet after the signal has been amplified and digitized.</p> <p>A 2-stage differential amplifier will be designed to filter out ambient electrical noise, as well as other signal interferences. The amplifier will also be designed to handle frequencies from 0 to 1kHz, which is where the usable energy of the EMG signal is found, with the dominant energy in the 50 to 200Hz range. The goal of the filtering is to maximize the signal to noise (SNR) ratio in order to deliver a clean and precise EMG signal for post processing. An Android application will be designed using the SDK to capture, analyze, store, and display the EMG signal.</p>	
URL	https://sites.google.com/a/temple.edu/muscle-machine-interface-senior-design	

SD2-09	Steel Bridges, Inc. (I)	EA 305 1:40 PM
Team Members	Kyle Stokel, Petar Ivacic, Jason Sharp	
Advisor(s)	Bechara Abboud	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	ASCE/AISC Steel Bridge Competition	
Abstract	<p>The design criteria for the 2012 ASCE/AISC Student Steel Bridge Competition is to construct a bridge over the fast-moving Phantom River for the Broken Paddle construction manager. The bridge needs to allow vehicles to reach the lodge and carry utilities under the bridge. Clearance is required under the bridge in order to prevent damage from flash floods. This parameter is part of the competition rules and creates a challenge when designing and constructing the bridge. Our objective is to successfully compete in the ASCE Student Steel Bridge Competition (SSBC) for the region with a 1/10 scale model bridge that meets all requirements and constraints. Our responsibilities are to design, analyze, fabricate, and construct a bridge model that meets the rules and dimensional requirements of the competition. This is done by using design software for a visual interpretation of our bridge and provides necessary data for evaluation. The bridge must be able to meet 12 different loading combinations and lateral sway without exceeding competition restrictions. The three categories the bridge will score on are Construction Economy, Structural Efficiency, and Overall Performance. The bridge that scores the lowest in Overall Performance will win the regional competition, and could receive an invitation to the national competition. Our team will have to develop a funding plan to be able to buy materials, fabrication and transportation for the materials. Our team will develop strategies to raise the funds to build a competitive bridge.</p>	
URL	https://sites.google.com/a/temple.edu/team-steel-1	

Team SD2-10	Next Level Charging	EA 308 1:20 PM
Team Members	Alex Cifelli, Kenneth McGuire, Jaykrishna Shukla and Nathaniel Weldon	
Advisor(s)	Dr. Saroj Biswas, Dr. John Helferty	
Coordinator	Frank Higgins, Fatehy El-Turky	
Department(s)	Electrical and Computer Engineering	
Project Title	Small Scale EV Charging Station with VAR Compensation	
Abstract	<p>The Next Level team's set of small-scale battery charger models will take into account various scenarios of electric vehicle battery charging. The residential model will be the base model for all Next Level charging models; able to simulate the charging of an electric vehicle battery with a PIC32 microprocessor control system in a slow charge (Level 1) mode. The street-side model will include a user interface that will allow customers to select Level 1 or Level 2 charging; the added feature will be a magnetic reader with a subscription service for power transactions. Lastly, the industrial model will include an interface that is capable of Static VAR Compensation to an inductive load. This simulation will use the inductive load as a test for the system's capability of power factor correction. A software algorithm will be designed to track the difference between two single-phase sinusoidal sources, allowing for future synchronization to the grid.</p> <p>The Next Level system will charge a common 12V 21Ah automobile battery in a 2.5A and 4A mode, and will terminate charge at 90% SoC. The unit will weigh less than 15 lbs, and cost \$750, making it the ideal learning choice for universities or corporations.</p>	
URL	https://sites.google.com/a/temple.edu/commercial_electric_car_charger/home	

Team SD2-11	King of the Sea	EA 305 3:00 PM
Team Members	Manoli Alexopoulos, Tristan Gargan, Christopher Hall and Kevin Talley	
Advisor(s)	William Miller and Felix Udoeyo	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	2012 ASCE Concrete Canoe Competition	
Abstract	<p>The American Society of Civil Engineers (ASCE) National Concrete Canoe Competition (NCCC) allows students to creatively apply practical engineering principles in a competitive environment. Designing and constructing a canoe from concrete, reinforcement and buoyant materials, while following contest regulations, remains the primary objective for King of the Sea. While being compliant with the NCCC rules, King of the Sea's canoe (Yellow Submarine) will have a length of 21 feet, a width of 29 inches, a depth of 14 inches and a thickness of 0.5 inches. The canoe will be comprised of reinforcement with a minimum percent open area (POA) of 40% and concrete not exceeding a plastic unit weight greater than 62 lb/ft³. The environmentally friendly lightweight concrete mixture is mainly composed out of Portland cement Type I, fly ash class C, silica fume, concrete sand and expanded glass. Stress and buoyancy analyses and concrete compression tests will lead King of the Sea to an effective and successful racing canoe.</p>	
URL	https://sites.google.com/a/temple.edu/asce-concrete-canoe-competition-2012	

Team SD2-12	High CLASS	EA 308 1:40 PM
Team Members	Yuri Apel, Bill Bagdon, Gaurang Bharucha and Gaurang Fuletra	
Advisor(s)	John Helferty, Shriram Pillapakkam and Susan Sawyer	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer Engineering	
Project Title	NASA Lunabotics Mining Competition	
Abstract	<p>NASA is hosting the 3rd Annual Lunabotics Mining Competition May 21st to 26th 2012. The purpose of this competition is to design an excavator that is capable of collecting lunar regolith. The scoring metric for the competition consists of: Weight of the Lunabot; amount of regolith collected; average bandwidth; and autonomous capabilities. These items will be averaged over two, twenty minute rounds. We must meet the design constraints of: total weight under 80 kilograms (kg), height of .75 meters (m), and base of 1.5 m x 1.5 m. The communication is restricted to 802.11 B/G, but may not exceed 5 Mbps average bandwidth.</p> <p>Our control system will include fail safes for each system used in the autonomy, as well as manual control for backup. Obstacles in the LunArena will be detected and avoided via an onboard computer vision system. We will create a Graphical User Interface to read all incoming data from the robot, as well as the energy consumed by the robot. The Lunabot will process the camera data onboard to reduce the bandwidth consumption. The secondary system will consist of the gyroscope, magnetometer and accelerometer to detect if the Lunabot is, in fact, moving in the expected directions.</p>	
URL	https://sites.google.com/a/temple.edu/senior-design-2012	

Team SD2-13	River Power	EA 304 2:00 PM
Team Members	Ryan Berger, Zac Coulson, Mike Sarappo, and Andrew Stoeckle	
Advisor(s)	William Miller	
Coordinator	Richard Cohen	
Department(s)	Civil and Environmental / Mechanical	
Project Title	Modernizing the Water Wheel	
Abstract	<p>In today's high tech world, everything relies on electricity. Power generation is a major issue in even the most developed countries. Mankind is looking for new energy sources as we move away from fossil fuels, and one potential solution is to capture the power of moving water in rivers. Most river projects involve the use of submerged turbines to produce electricity. This project will take a different approach, incorporating technology that has proven successful throughout history: water wheels. Water wheels were invented by the Greeks around 3 B.C., and were used well into the twentieth century. Today water wheels are only historic relics, but we will bring them into the modern age of electricity generation.</p> <p>Our group has designed a system that uses the power of water flow in rivers to produce electricity, using a paddle wheel design. The system is supported by floating pontoons, and consists of a rotating wheel, driven by the water flow, that turns a shaft. The shaft then drives a transmission system, and ultimately this mechanical energy is converted into electrical energy by an alternator. The design incorporates readily available materials and has a higher power-to-cost ratio than other comparable river-energy systems.</p>	
URL	https://sites.google.com/a/temple.edu/sdteam4	

Team SD2-14	RockSat 2012	EA 308 2:00 PM
Team Members	Fred Avery, Ny 'Jaa Bobo, Gene Council and Salvatore Giorgi	
Advisor(s)	John Helferty and Shriram Pillapakkam	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer / Mechanical	
Project Title	Near Space Biological Acquisition Unit	
Abstract	<p>Microbiology in the atmosphere, despite being relevant to climate studies, health and agriculture, remains relatively unstudied. Since the payload canister can be equipped with an air intake valve we propose to use our canister as a biological acquisition unit. Specifically, we will address residency time, types and concentration of microbes, and the mechanism by which the microorganisms repair their DNA from UV damage. To do this we will equip the canister with a spectrometer, which will measure UV flux as a function of altitude, and a series of filters designed to capture material suspended in the atmosphere between 6 and 120 km. We will also measure the earth's magnetic field strength and flight dynamics of the rocket. Since our team is composed of both Electrical and Mechanical Engineers our design will be broken up in two parts. The electrical component will consist of power supply, data processing and storage, and implementation of the spectrometer, accelerometers, gyroscope, and magnetometer. The mechanical component will consist of designing a mechanism to open and close the canister's atmospheric port and filtration device at specific altitudes, mounting and securing all devices inside the canister, and properly adjusting the moment of inertia and center of gravity.</p>	
URL	https://sites.google.com/a/temple.edu/rocksat	

Team SD2-15	Concrete Innovation	EA 305 3:20 PM
Team Members	Jerrin George, Stephen Gowan, Karen Stoner and Toan Vo	
Advisor(s)	Felix F. Udoeyo	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	Design and Maturity Testing of Rigid Sidewalk Containing GGBFS	
Abstract	<p>Concrete Innovation will design and construct a rigid sidewalk using recyclable materials and the maturity method to reduce construction costs and time, respectively. A construction site will be acquired and analyzed for our sidewalk which will be designed for pedestrian traffic, based on the American Association of State Highway and Transportation Officials (AASHTO) design standards and the Pennsylvania Department of Transportation (PennDOT) specifications. The concrete mixes will be designed with a mixed aggregate, binder (containing recyclable cementitious material called ground granulated blast furnace slag [GGBFS]), and a water/binder ratio that will not have adverse affects on the sidewalk's flexural strength and 28-day compressive strength of 500 psi and 3,300 psi, respectively. Multiple concrete cylinders will be processed and tested during construction of the sidewalk, based on the American Society for Testing of Materials (ASTM) standards. Compressive testing of these specimens along with data acquired from a maturity meter will create the maturity curve for our mixture. The maturity method uses this curve to estimate the strength of concrete based on curing time and temperature during curing in lieu of time consuming traditional testing methods.</p>	
URL	https://sites.google.com/a/temple.edu/concrete-innovation/	

Team SD2-16	HPVC	EA 304 3:00 PM
Team Members	Zach Fisher, Hon Lung Giang, James Hoffman and Kurt Lutz	
Advisor(s)	Shriram Pillapakkam	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	Human Powered Vehicle	
Abstract	<p>With fuel costs rising daily and traditional combustion engines slowly killing the environment, a safe and reliable mode of transportation is in demand for suburban and inner-city commuters. The goal of this design is to provide consumers with a vehicle propelled solely by a power input from the user to deliver a practical, alternate means of transportation in an urban or rural setting. The vehicle will combine the practicality of traditional human powered vehicles, such as the bicycle, with the innovative features native to recumbent bikes, such as increased overall performance, efficiency, and an ergonomic design.</p> <p>To obtain an increase in overall performance over traditional human powered vehicles, this design focuses on reducing wind drag, improving user safety, and increasing the efficiency of the user's power input by utilizing a fixed back support, adjustable seating point, and optimum crank position. The vehicle will include front, side, and rear fairings, an adjustable gear set, roll cage, and short front-to-back wheel base to conserve material and sustain the ability to fit on a traditional-sized bike rack. The final product of this design will be evaluated at the annual ASME human powered vehicle competition.</p>	
URL	https://sites.google.com/a/temple.edu/hpvc	

Team SD2-17	Steel Bridge, Inc. (II)	EA 305 2:00 PM
Team Members	Matt Castro, Mody Said, John Perry and Uykong Lor	
Advisor(s)	Bechara Abboud	
Coordinator	Robert Ryan, Joseph Picone	
Department(s)	Civil and Environmental Engineering	
Project Title	2012 ASCE/AISC Student Steel Bridge Competition	
Abstract	<p>A Temple University team of senior civil engineering students will participate in the 2012 National Student Steel Bridge Competition. The competition challenges university teams to design and build a 1/10 scale steel bridge that can resist 2500lbs of vertical and 50lbs of lateral loading while adhering to specific design and assembly constraints. The bridge must also be constructed onsite in a timed format. Participation in the competition will provide an outlet for the team of future structural engineers to tackle a tangible engineering problem and see the real world effects of their paper-based and software-based decisions. The team will design a bridge that should be lighter than 183lbs, experience aggregate vertical deflection less than 0.337 inches under loading and be able to be constructed in less than 33.17 builder-minutes. Software simulation and small scale hardware prototype testing will aid in that process and a final design will then be fabricated to 1/1000th inch tolerances and tested to competition standards. At regional competition at Lafayette College in April, 2012 the team will attempt to place in the top 3 and earn a berth to Nationals held May. 25-26, 2012 at Clemson University.</p>	
URL	https://sites.google.com/a/temple.edu/steelbridge2	

Team SD2-18	Aquatic Acquisition	EA 311 1:20 PM
Team Members	Timothy Groves, Peter Lamaina and Tracy Nguyen	
Advisor(s)	Seong Kong	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer Engineering	
Project Title	Digital Communications Device for Divers using High Frequency Sonar	
Abstract	<p>Currently, there are devices that allow submerged divers to communicate with one another. These devices are expensive but they allow the diver to speak with their partner. Hand signals can be used to communicate, but in dark, murky water, this method is ineffective. Our team will design an underwater communication device that will transmit and receive four messages; each message will be a different fixed amplitude sine wave with a frequency of 1 kHz. The sonar signal will travel a maximum of 80 feet. A microcontroller will be used to integrate the transmitter, receiver, and LEDs. The device is intended to be powered by the use of a rechargeable battery and there needs to be enough power for the device to last the length of an average dive, approximately 80 minutes. The greatest challenge our team faces will be to overcome signal fading produced by the time-varying nature of the underwater communications channel. The algorithm we create will be essential in allowing the transmission of messages over longer distances at a lower cost than devices currently available.</p>	
URL	https://sites.google.com/a/temple.edu/aquatic	

Team SD2-19	Green Flow Engineering	EA 311 1:40 PM
Team Members	Allen Brown, Navin Davis, Jonathan Hartman and Brendan Moran	
Advisor(s)	Robert Ryan	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental / Electrical and Computer / Mechanical	
Project Title	Hydro Turbine Generator	
Abstract	<p>Our project is to design and build a hydro-turbine generator system that is placed in small rivers for residential or semi-permanent campsite uses. The system will use an Ampair UW100 water turbine with a custom designed and built diverging duct that will increase flow across the turbine blades and thereby, produce a greater power output than would an unducted turbine. An anchoring system will be designed to place the turbine at an appropriate depth in the flow and to prevent it from being dragged downstream during a large flood event. A real-time power processing unit (PPU) will be programmed to monitor and control an overcharge protection system operating a network of relays. Power from the battery will be converted from direct current (DC) to alternating current (AC) so that the user can run household appliances.</p> <p>Our goal is to exceed the 4 watt output measured in field tests without the duct. Overall, we aim to utilize the above components to produce a reliable and user-friendly system.</p>	
URL	https://sites.google.com/a/temple.edu/htg	

Team SD2-20	Stormwater Solutions	EA 305 3:40 PM
Team Members	Jeremy Helcoski, Michael Huylo and Ramy Shalabi	
Advisor(s)	William Miller and Paul Lonie	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	Stormwater Detention Tank	
Abstract	<p>The city of Philadelphia utilizes a combined sewer system that collects and treats stormwater and sewage using the same infrastructure. A large rainfall event can place a great deal of stress on the city's treatment plant and possibly result in raw sewage being released into the river. In order to prevent this, runoff must be reduced. The financial burden of retrofitting stormwater infrastructure has been placed on individual property owners in the form of a service charge. If these owners prevent the first inch of rain per storm from entering the combined sewer, they can apply for stormwater credits and decrease their monthly charge. We will design a detention system that will capture the first inch of rain per storm that falls on Temple University's parking area seven. A detention basin of at least five thousand cubic feet will be located in the grass area near Gladfelter Hall. A pump, located beneath the location of the existing parking lot drain, will transport the runoff from the lot to the basin. This water will then be allowed to slowly infiltrate into the soil. This reduction in stormwater runoff will result in savings of six thousand dollars a year for Temple University.</p>	
URL	https://sites.google.com/a/temple.edu/stormwater-detention-tank	

Team SD2-21	Eyes for the Blind, Inc.	EA 311 3:20 PM
Team Members	Cong S. Cun, Ming H. Huang, Vincent M. Pugliese and Ranjodh Singh	
Advisor(s)	Fatehy El-Turky	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer / Mechanical Engineering	
Project Title	Ultrasonic Detection for the Blind/Visually Impaired	
Abstract	<p>It can be very difficult for the visually impaired to travel and navigate an unknown area safely without the use of a white cane. Our intentions are to design a cane and body vest with built-in ultrasonic sensors, which will detect potential objects that may be in the user's path. Aiming to effectively aid the blind user to avoid objects and have a sense of their environment. The sensors will be strategically placed around the vest and one on the cane which will transmit high frequency pulses that will echo off any obstacles within the range of the sensors. With an object present, these signals echo back and return to the receiver where a microcontroller processes the information determining the total distance the user is from the obstacle. A glove worn by the user will alert him/her of the direction of the obstacle ahead using a vibro-tactile feedback system. There are vibrators with 3 intensity settings proportional to the distance of the object, which will be altered using pulse-width modulation. The vest also contains a set of motors on the shoulders will vibrate when an object at head height is detected, thus giving the user a sense of their environment.</p>	
URL	https://sites.google.com/a/temple.edu/detection-for-the-blind	

Team SD2-22	Banner Bikes	EA 311 3:00 PM
Team Members	Tan Ha, Bayan Khalighi, Asish Mathew and Robert Stark	
Advisor(s)	Li Bai	
Coordinator	Frank Higgins	
Department(s)	Electrical and Computer / Mechanical Engineering	
Project Title	A Pedal Electric Hybrid Bicycle	
Abstract	<p>While a bike is coasting, energy is being wasted. It would be great if you could capture the potential and kinetic energy as you coast instead of wasting it. This would allow you to travel farther by using the energy captured in the downhill decent to propel the bike. We plan to make this possible by using a permanent magnet DC motor that can act as a generator to capture energy and store it in a battery. This would achieve the functionality of a pedal/electric bicycle. Furthermore, the energy you store can be used to charge USB devices. This USB interface allows users to mount smart phones onto the bicycle to follow GPS or monitor the status of the ride.</p> <p>There are several engineering challenges that must be overcome to build an efficient electric bike with energy recovery capabilities. There are ideal gear ratios for driving the bike, and different ratios for charging the battery. We want to create a seamless riding experience for the user to adjust these settings on the fly similar to the systems already installed for adjusting the gears on bicycles. We plan to develop a versatile bike with features ideal to the market of sales.</p>	
URL	https://sites.google.com/site/greengym21/	

Team SD2-23	Rat Pack Engineering	EA 308 3:40 PM
Team Members	Rohan Greenfield, Drew Krause and James Love	
Advisor(s)	Kurosh Darvish and Soroush Assari	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	Testing of Brain Injury with Shocktube	
Abstract	<p>Shocktube devices are used to reproduce traumatic blasts. Since damage caused by blasts is difficult to observe in situ, a model to reproduce the blasts on test specimens has been developed in which live mice specimen are placed in a fixture to observe the reactions on the brain. A pressure field of desired interest around the shock tube has been measured. The first and second goals were to characterize the pressure inside the shocktube and outside the end. Thirdly, a fixture for securing mice specimen under different conditions has been designed and constructed. The first set of sensors and the specimen fixture were built prior to testing its operation and functionality while working with Dr. Darvish and graduate students to observe the interactions necessary to continue research in this study. The sensor required a device suitable for positions where the sensor can be easily switched to and from without affecting the readings at differing locales. The fixture required test specimen is easily changed. Design of the fixture must also allow the blast to impact varying parts of the specimen body and be able to easily modify test specimen orientation.</p>	
URL	https://sites.google.com/a/temple.edu/theratpack	

Team SD2-24	Hydro Sustainable Consultants	EA 308 3:40 PM
Team Members	Thelma Chuene, Faye Majekodunmi, Ezekiel Ola and Samantha Schmoyer	
Advisor(s)	Alex Diloyan	
Coordinator	Richard Cohen	
Department(s)	Civil and Environmental / Mechanical Engineering	
Project Title	Enhanced Stormwater Drainage System using Rainwater Harvesting	
Abstract	<p>The city of Philadelphia receives an average rainfall of 42 inches annually leading to an excess of stormwater runoff and sewer overflow. To address this need for stormwater management, a rainwater capture and reuse system has been designed and constructed for the Church of the Advocate, located in Philadelphia, Pennsylvania. This sustainable system is designed to hold up to 150 gallons of water while eliminating contaminants such as metals, solid particles, nutrients and organics to a level that satisfies non-potable water standards. The design begins with a catchment surface (roof) of approximately 1000 square feet that directs the rainwater from the rooftops to rain barrels for filtration and storage. The water is then distributed upon demand, at a pressure of 40 psi, through a pump system to the property. This system serves as a significant advantage to the church because it reduces the church's water costs by \$300 per year and illustrates the importance of environmental conservation. The system also reduces municipal concern regarding the amount of purified water used for sanitation. The estimated cost for such a system is \$3000, which is relatively economical since it yields benefits far beyond the initial investments.</p>	
URL	https://sites.google.com/a/temple.edu/sustainable-design	

Team SD2-25	Engineering For A Third World Future	EA 308 3:00 PM
Team Members	Paul Ebert, Jovana Radojevic, Josh Sewald and Djordje Vilimanovic	
Advisor	Dr. Sai Nudurupati	
Coordinator	Dr. Richard Cohen	
Department(s)	Civil and Environmental / Mechanical	
Project Title	TUBUV: Designing a Basic Utility Vehicle	
Abstract	<p>Third world nations are in need for transportation systems that will allow them to expand socially, culturally and economically. In these countries the transportation of agricultural goods and tools is essential for survival and growth. Due to the lack of paved roads and low amount of financial resources in such regions, commercial trucks are not an option. This project will introduce the designing, manufacturing, and testing of a Basic Utility Vehicle (BUV) that meets a very specific set of requirements that will aid in these nations' development. This project is in association with the National Student Design Competition that is supported by Institute for Affordable Transportation (IAT). The vehicle will be powered by a 10horsepower gasoline engine. It will weigh less than 1000 pounds, and its dimensions will be smaller than 12 feet in length and 5 feet in width. Our BUV will be simple to build and easy to maintain. Its simplicity will not ignore functionality. The BUV bed will be able to withstand a 500 pound loading force and tow 1000 pounds. With this project we can improve the lives of the world's poor population by providing a low-cost vehicle to facilitate community transformation and transportation.</p>	
URL	https://sites.google.com/a/temple.edu/templeu_buv/	

Team SD2-26	Every Drop Counts, Inc.	EA 308 3:20 PM
Team Members	Haoxiang Ruan, Jayesh Patel, Nam-Giao Tran and Siyun Liu	
Advisor(s)	William Miller	
Coordinator	ROBERT RYAN	
Department(s)	Civil and Environmental Engineering	
Project Title	Greywater/Rainwater Recovery System for Water Reuse	
Abstract	<p>Water is an indispensable natural resource for human beings, animals, and plant growth. With the speed of technologic development and the gradual improvement of people's living style, water resources are becoming endangered. Water reuse has proven to be effective and successful in creating a reliable water supply without compromising public health. Acknowledging this fact, many wastewater treating systems, including those that recycle greywater and rainwater for reuse purposes, have been designed and brought into peoples' attention. In the current market, they are designed and assembled as two separate systems. Our team will model a filtration system which recycles both greywater and rainwater in one scheme for toilet flushing and landscape irrigation at the household level. Our main purposes of designing the system are to improve water conservation, to minimize the water demand from city water, and to prevent wastewater going to sewer. For a single family of four members, our recovery system would help reuse at least 160 gallons of water per day for toilet flushing and irrigation. With clear design processes and design constraints established at the outset of the project, we believe that our product would be trusted and widely used in the community in a near future.</p>	
URL	https://sites.google.com/a/temple.edu/water-savers/home	

Team SD2-27	Forward Thinking	EA 304 3:20 PM
Team Members	Alani Intintolo, Rehan Munshi, Vincent Pesce and Samantha Schoell	
Advisor(s)	Vallorie Peridier	
Coordinator	Richard Cohen	
Department(s)	Mechanical Engineering	
Project Title	Disney ImagiNations Design Competition	
Abstract	<p>The Walt Disney ImagiNations Competition asks students across diverse educational backgrounds to design a fun and interactive theme-ride or attraction, along with a compelling story.</p> <p>Our design will be based on the Disney-Pixar movie, <i>The Incredibles</i>. The ride vehicle will be designed as a spherical pod, which will be set in a rotating frame mounted in a moveable chassis. Motors will be used to control the roll and pitch of the ride. The pod will sit on a platform, which will be capable of experiencing a yaw of 360°, giving the ride a total of three degrees of freedom. Each pod will be based off one of the four main characters of the movie, allowing the riders to experience the different powers of each character. There will be two riders per pod for a total of eight riders per “loop.” This will minimize the overall size and weight of the ride vehicle. These features will create a sense of randomness for each rider, allowing them to experience the same ride in a different way each time. We plan on building a quarter scale working prototype which will be capable of our desired movements.</p>	
URL	https://sites.google.com/a/temple.edu/forwardthinking	

Team SD2-28	DDL, Inc.	EA 304 3:40 PM
Team Members	Bryan Dallas, Christopher Decker, Hung Ly	
Advisor(s)	Parsaoran Hutapea	
Coordinator	Richard Cohen	
Department(s)	Electrical and Computer / Mechanical Engineering	
Project Title	Lithium-ion Battery Thermal Management System	
Abstract	<p>Electric Vehicles today, such as the Nissan Leaf, Chevy Volt, and Tesla Roadster, all use Lithium-ion batteries as a power source. In order for electric vehicles to be competitive, they must be stable and reliable. One important consideration is the care of the batteries used in the vehicle to insure performance longevity and efficiency. Different types of lithium-ion batteries possess certain ideal temperature ranges to prevent degradation and short life cycles. During charging and discharging, the batteries produce heat. At high temperatures, lithium-ion batteries degrade because the electrolyte reacts with the active electrodes, thus reducing its potential. It is also important to avoid running the batteries at lower temperatures because of poor discharging characteristics. The objective of this design project is to create a battery thermal management system to maintain batteries within their ideal temperature range and increase their life span. We will design a small scale system for Lithium-ion Iron Phosphate batteries, whose ideal temperature range is between 25°C-35°C. The system will be controlled by a microcontroller that monitors the temperature of the battery modules and activates the cooling/heating components. To test our design, we will compare the charge/discharge cycle of the battery with and without the cooling/heating system.</p>	
URL	https://sites.google.com/a/temple.edu/teampropagation	

Team SD2-29	Wasteworks	EA 311 3:40 PM
Team Members	Zachariah Beaver, Benjamin Deatrich, Kevin McGinley and Vincent Whelan	
Advisor(s)	Benoit Van Aken	
Coordinator	Robert Ryan	
Department(s)	Civil and Environmental / Mechanical Engineering	
Project Title	Modeling and Analysis of Small-Scale Wastewater Treatment System	
Abstract	<p>Wastewater is polluted water containing various types of waste, including human waste, industrial pollutants and agricultural runoff. Treatment is necessary in order to safely discharge wastewater back into the environment. The general treatment process involves preliminary treatment, primary treatment, secondary treatment and advanced treatment. Primary treatment removes most solids by flocculent settling. Secondary treatment further removes remaining suspended solids and biological oxygen demand by a biological reaction. Advanced treatment processes vary, and involve chemical treatment and filtration. A bench-scale model of a wastewater treatment plant for laboratory use can provide insight into how individual treatment processes work. Yet designing a bench-scale model comes with many design obstacles due to the size of the system. It is useful to isolate secondary treatment, the most complex process, as the focus of the bench-scale model. The model will be designed to remove 85% to 95% of BOD from synthetic wastewater using activated sludge in a sample size of 5-10 liters. The use of computational modeling software will be used to correlate and validate the results of the bench-scale model. A functional and accurate bench-scale wastewater treatment model will be a useful tool for research in wastewater treatment at Temple University in the future.</p>	
URL	https://sites.google.com/a/temple.edu/small-scale-treatment/	

Team SD 2-31	Dima Engineering	EA 311 2:00 PM
Team Members	Basel Yandem, Tarek Sayegh	
Advisor(s)	Dr. William Miller and Dr. Paul Lonie	
Coordinator	Dr. Robert Ryan	
Department(s)	Civil and Environmental Engineering	
Project Title	Parking Lot Stormwater Harvesting	
Abstract	<p>Sewers can overflow during heavy rainstorms and the excessive amount of stormwater can cause flooding and property damage. Stormwater becomes polluted when it picks up toxic chemicals and debris from the ground, and does not always get treated after passing through the sewer system due to the restricted capacity of sewage treatment facilities. The water is also wasted when it could be reused at sources where fresh drinking water is not necessary. Additionally, the Philadelphia Water Department (PWD) requires that the first inch of rain to be retain on the property where it falls. Our team will design a system to harvest the stormwater falling on the roof of the Engineering and Architecture Building at Temple University. The stormwater harvested will be filtered to remove any debris. Although it will not be treated for drinkability, the system will be designed to use the water for flushing toilets inside the Engineering and Architecture Building on campus. The system can reduce the water bill by about 80%. It can also help the environment by reducing the amount of polluted water in the ecosystem. Additionally, the system will exclude the Engineering and Architecture Building from any impervious surface-related fees that the PWD collect.</p>	
URL	https://sites.google.com/a/temple.edu/dima/home	