

Senior Design Day:
Final Presentations, Posters and Demonstrations

November 18, 2010

 

***Welcome to Senior Design Day, Fall 2010.***

On behalf of the Temple College of Engineering and the Senior Design Coordinating Committee, we would like to welcome you to Senior Design Day for Fall 2010.

Senior design is an important capstone design experience for undergraduate engineers. For many of our students, this is the most significant engineering experience they will encounter during their undergraduate program of study. 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.

We hope you will enjoy the presentations, posters and demonstrations 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 Steering Committee:

Richard Cohen

Frank Higgins

Joseph Picone

Sandip Shah

**Presentation Schedule**

Note: Presentations designated with an “FX” are presentations to be given by the Fox MBA students (e.g., SD I – 34FX).

|  |  |  |  |
| --- | --- | --- | --- |
| Day | Time | Room |   |
| Dr. Cohen | Dr. Shah | Dr. Higgins | Dr. Picone | Dr. Silage | Posters |
| HGSC SC 223(50) | HGSC SC 220(50) | HGSC SC 206(15) | HGSC SC 205(12) | HGSC SC 207(12) | HGSC SC 200A(N/A) |
| 11/18/10 | 12:00 PM | SD I - 34 | SD I - 30 | SD I - 20 | SD I - 08 | SD I - 36 | **ALLGROUPS** |
| 11/18/10 | 12:20 PM | SD I - 34FX | SD I - 29 | SD I - 20FX | SD I - 08FX | SD I - 06 |
| 11/18/10 | 12:40 PM | SD I - 33 | SD I - 18 | SD I - 21 | SD I - 01 | SD I - 35 |
| 11/18/10 | 1:00 PM | SD I - 32 | SD I - 17 | SD I - 21FX | SD I - 01FX | SD I - 31 |
| 11/18/10 | 1:20 PM | SD I - 26 | SD I - 16 | SD I - 23 | SD II - 07 | SD I - 22 |
| 11/18/10 | 1:40 PM | SD I - 24 | SD I - 11 | SD I - 23FX | SD II - 06 | SD I - 10 |
| 10/19/10 | 2:00 PM | **BREAK** | **BREAK** | **BREAK** | **BREAK** | **BREAK** |
| 11/18/10 | 2:20 PM | SD I - 19 | SD I - 09 | SD I - 12 | SD II - 05 |  |
| 11/18/10 | 2:40 PM | SD I - 15 | SD I - 05 | SD I - 12FX | SD II - 04 |  |
| 11/18/10 | 3:00 PM | SD I - 14 | SD I - 03 | SD I - 27 | SD II - 03 |  |
| 11/18/10 | 3:20 PM | SD I - 13 | SD I - 02 | SD I - 27FX | SD II - 02 |  |
| 11/18/10 | 3:40 PM | SD I - 07 | SD I - 04 | SD I - 28 | SD II - 01 |  |
| 11/18/10 | 4:00 PM | **BREAK** |   |
| 11/18/10 | 4:20 PM |   |
| 11/18/10 | 4:40 PM |   |
| 11/18/10 | 4:40 PM |   |
| 11/18/10 | 5:00 PM | **ALL SD II POSTERS (DIAMOND CLUB: RHOADES ROOM)** |   |
| 11/18/10 | 5:20 PM |   |
| 11/18/10 | 5:40 PM |   |
| 11/18/10 | 6:00 PM |   |

**Table of Contents**

**Senior Design I:**   1

Team SD1-01: Hybrid DSP/Vacuum Tube Amplifier   2

Team SD1-02: ASCE 2011Concrete Canoe Competition   2

Team SD1-03: Maximizing the Performance of a Pervious Pavement System   3

Team SD1-04: Efficient Energy Using a Submersed Closed-Loop Geothermal System   3

Team SD1-05: Pure Energy   4

Team SD1-06:  NASA Lunabotics Mining Competition  4

Team SD1-07:  Energy Modeling to Reduce Energy Consumption  5

Team SD1-08: A Non-invasive Brain to Computer Interface System for Video Gaming  5

Team SD1-09:  Design and Construction of a Solar Powered Space Heater  6

Team SD1-10:  Nonlinear Control of Laser Targeting System  6

Team SD1-11: Harvesting Stormwater Runoff for Urban Farm Irrigation  7

Team SD1-12: Multi-Function Touch Screen Display Using Vehicle On-Board-Diagnostics  7

Team SD1-13:  Development of a Hybrid Fuel Cell Electric Powertrain  8

Team SD1-14: An Apparatus to Study the Effects of Mechanical Input on Articular Cartilage Growth   8

Team SD1-15: Diesel Propulsion Drone   9

Team SD1-16: Adaptive Structural Retrofits Using Building Information Modeling   9

Team SD1-17: The Performance of an Engineered Wetland to Control Eutrophication   10

Team SD1-18: Improved Free-Flow Hydroturbine Performance Using a Ducted Design   10

Team SD1-19: Effect of Coolant Passage Design Parameters on Fluid Pressure and Velocity Distribution   11

Team SD1-20:  Intelligent Reconfigurable Power Grid  11

Team SD1-21: Engine Heat Power Recovery From Thermoelectric Generation   12

Team SD1-22: Indoor Aerial Autonomous Coaxial Rotorcraft   12

Team SD1-23: Implantable Blood Pressure Monitor   13

Team SD1-24: Enhanced Wind Turbine Performance using Compliant Rotor Technology   13

Team SD1-26: Optimizing Damper Stiffness in Formula Racecars Using MR Fluid   14

Team SD1-27: Universal Remote Locator Device Using an RF Transmitter and Receivers   14

Team SD1-28: Data Glove Gesture Recognition for Augmented Reality Applications   15

Team SD1-29: Predicting Moment and Shear Capacities of SCC Using Dimensional Analysis   15

Team SD1-30:  Evaluating CKD in Self-Consolidating Concrete Mixtures  16

Team SD1-31: Vehicle Magnetic Field Reduction for Mine Protection   16

Team SD1-32: Testing of Yamaha Genesis 80FI Engine for the Formula SAE Racecar   17

Team SD1-33: Development of a Shock Tube for Research in Traumatic Brain Injuries   17

Team SD1-34: Low Cost Device for Testing Aerobic Performance in Rodents   18

Team SD1-35: Biometric Detection for Improved University Attendance   18

Team SD1-36: Sub-Orbital High Energy Particle Observer   19

**Senior Design II:**   20

Team SD2-01: Harnessing Wind Energy for the Integration of Sustainable Energy   21

Team SD2-02: Renewable Energy Using High-Efficiency Turbines   21

Team SD2-03: Solar Concentrator: An Angled Attack on the Energy Crisis   22

Team SD2-04: Solar Concentrator: Improving the Efficiency of Solar Collection  22

Team SD2-05: Wind Turbine Blade Pitch Control  23

Team SD2-06: A High Efficiency Oil Circulation System for a Windmill Gearbox   23

Team SD2-07: The Percolator Project: Providing Developing Nations With Low Cost Drinking Water   24

**Senior Design I:**

**… To design, simulate and prototype …**

**“Simplicity is the ultimate sophistication.”**

**Leonardo da Vinci, circa 1475**

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| **Team SD1-01** | **Victory Amplification** | **HGSC SC 205 12:40 PM** |
| **Team Members** | George Fava, Jeff Gregorio, Jessica Jackson and Dennis McGovern |
| **Advisor(s)** | Joseph Picone |
| **Coordinator** | Joseph Picone |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Hybrid DSP/Vacuum Tube Amplifier |
| **Abstract** | Vacuum tube guitar amplifiers provide tonal characteristics desirable to musicians, yet can be rather limited in flexibility. The Hybrid DSP/Vacuum Tube Guitar Amplifier offers an uncommon combination of a preamp that utilizes DSP algorithms with a vacuum tube power amplifier. The result will be a much more versatile amplifier, offering the best of the analog and digital worlds.Our DSP modeling-based preamp will receive a high impedance signal from a guitar pickup and replicate the harmonics and non-linearities generated by a vacuum tube preamplifier. A gain control will allow Total Harmonic Distortion increasing upwards from 2%. A three-band equalizer will provide tonal flexibility over the typical frequency range of an electric guitar amplifier (about 80 Hz to 20 kHz).Our vacuum tube-based power amplifier will be designed as a class AB amplifier with a linear gain response and will operate at a minimum worst-case efficiency of 25%. It will receive a line-level signal and have an output current sufficient to drive an external speaker enclosure with an RMS rating of 50 Watts at an output impedance of 4 or 8Ω.  |
| **URL** | http://sites.google.com/a/temple.edu/dspamp/ |
| **MBA Team** | Ryan Taylor, Kyle Dumont, Sonal Bedi and Seth Hagarty |
| **MBA Advisor** | Neeraj Bharadwaj |
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| **Team SD1-02** | **Above Level** | **HGSC SC 220 3:20 PM** |
| **Team Members** | Ali Atif, Alixandria Lane, Enoque Panzo, Megan Swartwood and Brian Worthington |
| **Advisor(s)** | William C. Miller and Xiaofeng Zhang |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | ASCE 2011Concrete Canoe Competition |
| **Abstract** | The ASCE Concrete Canoe Competition requires students to research, analyze, design, and construct a canoe that is made of concrete. The goal is to design and construct a canoe that meets the rules and regulations mandated by the National Concrete Canoe Committee while optimizing a standardized hull design with concrete and reinforcement that must meet the following requirements: a water-cement ratio of 0.40, an air-entrained mix of at least 6%, use two recycled aggregates that comprise at least 50% of the aggregates by mass, and utilize reinforcement that do not exceed a 30% POA determined by the thickness of the structural elements. The team will optimize the hull design by making the thickness 1 inch all around, so that the canoe does not gain extra weight. The use of lightweight material for our concrete mix will be a crucial component to produce a buoyant canoe. Available modeling and analysis software, AutoCAD, SolidWorks, and MATLAB will be used to model the canoe. The ultimate goal with both molds is to create a uniform shape that will also maintain the desired canoe thickness and meet ASCE Concrete Canoe competition specifications. The Above Level Team’s designs and innovations will be studied and served as a benchmark for future generations of any other Temple University Concrete Canoe Team. |
| **URL** | http://sites.google.com/a/temple.edu/acse-concrete-canoe-competition-2011/ |

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| **Team SD1-03** | **Team GeoPavement** | **HGSC SC 220 3:00 PM** |
| **Team Members** | Stephen Dobron, Corben Fuentespina, Parin Patel and Chinhang So |
| **Advisor(s)** | Naji Khoury |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Maximizing the Performance of a Pervious Pavement System |
| **Abstract** | The wide-scale implementation of Pervious Pavement Systems (PPS) is critical in today’s urban society. PPS reduce stormwater runoff volume and heavy metal contaminant levels by allowing infiltration through the pavement surface. However, accumulation of sediment in PPS from stormwater runoff restricts feasibility due to costly and frequent rejuvenation procedures necessary to combat the effects of clogging. The PPS will utilize a porous plastic-based cementitious (P-PBC) material previously developed by Dr. Naji Khoury at Temple University. P-PBC specimens will be tested for hydraulic conductivity using a modified falling head permeameter test. Test results must yield an initial conductivity value of at least 0.20 cm/s; while soil clogged specimens must meet a minimum of 0.10 cm/s. To determine the PPS’s ability to remove heavy metal contaminants we will use simulated stormwater runoff containing zinc, lead, copper, and cadmium. The heavy metal concentrations will be determined using a spectrophotometer and must be reduced by 75%. Additionally, a Toxicity Characteristic Leaching Procedure will be performed in order to verify that leaching from P-PBC meets EPA requirements. Success of this project will facilitate advances toward the widespread usage of PPS technology. |
| **URL** | https://sites.google.com/a/temple.edu/geopavement/ |
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| **Team SD1-04** | **TerraThermal Technologies, Inc.**  | **HGSC SC 220 3:40 PM** |
| **Team Members** | Ryan Burke, Steven Demmer, Kamil Nuzha and Kevin Ravasio |
| **Advisor(s)** | Michel Boufadel, Sandip Shah, Naji Khoury and Joseph Picone |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering, Mechanical Engineering |
| **Project Title** | Efficient Energy Using a Submersed Closed-Loop Geothermal System |
| **Abstract** | Traditional energy resources that rely on gas, oil, and coal are rapidly depleting fossil fuels. For this reason, a major thrust is being placed on renewable energy resources. TerraThermal Technologies will contribute to the transition to renewable energy by designing a closed-loop, pond integrated geothermal heating and cooling system. The system will provide for a housing development in Pittsgrove, New Jersey and will consist of 60 semi-detached units with average volumes of 14,800 ft3. To maximize efficiency and cost expenses, the high water table in the New Jersey area will be utilized to help maintain higher pond temperatures in the winter months by having an unsealed pond which will promote heat exchange between the pond water and the higher temperature ground water. Using pond water as the heat exchange medium will result in a faster and more efficient heat exchange rate for our system. This operation will result in 50% less energy consumption than conventional HVAC systems, which will also help to leave almost zero carbon footprint. A feasibility study based on data collected at the site will be performed to determine the effectiveness and possibility of this system succeeding based on the cost, life cycle, and performance advantages of this system. |
| **URL** | http://sites.google.com/a/temple.edu/ghcs/ |

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| **Team SD1-05** | **The Green Team**  | **HGSC SC 220 2:40 PM** |
| **Team Members** | Peter Attalla, Justin Barta, Nana Boateng and Harsh Patel |
| **Advisor(s)** | Alex Pillapakkam |
| **Coordinator** | Sandip Shah |
| **Departments** | Mechanical Engineering |
| **Project Title** | Pure Energy |
| **Abstract** | Developing an efficient, sustainable and environmentally friendly energy generating system for domestic use continues to pose a challenge to developers as well researchers. Over the last 30 years, there have been significant innovations developed to harvest natural energy from the sun and transform that energy to electricity for domestic use. The most widely used solar energy system for residential purposes are the photovoltaic (PV) solar panels but are very expensive to install and maintain. Stirling engines are also used for solar energy systems but are operated on a larger scale such as power plants. Up to this day, Stirling engines that have been operated locally have only been successful at transforming approximately 20% of incident solar energy into electricity. We propose to create a more efficient and cost effective solar electricity generating system powered by a Stirling engine. Our modified Stirling engine will seek to increase the efficiency of the old system by 100%. Our electric generating system will consist of three principal parts: a solar collector, a thermal transporting fluid medium and a redesigned Stirling engine. This system will receive thermal energy generated by a parabolic or dish solar collector, which absorbs more heat at higher temperatures. |
| **URL** | http://sites.google.com/a/temple.edu/pureenergy/ |
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| **Team SD1-06** | **Lunar Solutions I**  | **HGSC SC 207 12:20 PM** |
| **Team Members** | Rodney Nash, Cara Santin, Ahmed Youssef and Thien Nguyen |
| **Advisor(s)** | John Helferty |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | NASA Lunabotics Mining Competition |
| **Abstract** | In May 2011, NASA will host the second annual Lunabotics Mining Competition. Our team’s goal is to create robots to compete in, and ideally win, the competition. For the competition teams of undergraduate students build and remotely operate robots which are meant to mine and transport as much lunar material as possible in 15 minutes.Our design must meet several constraints outlined by NASA. The finished robot must weigh less than 80kg and cannot be more than 2m high. The WIFI communication bandwidth cannot exceed 5MB/sec. Also, the design must meet the cost budget set by NASA.Our excavation system is an enhanced design of the winning robot from last year’s competition. The system involves a conveyer belt system which transports material to a storage bucket. The robot will have four wheels and a direct drive system. We are analyzing various methods of depositing the material to find one which can accommodate the most weight. The design must be tested in a simulated environment similar to the one will be used in the competition.  The system will be powered using Li battery to obtain high current for the motors. A micro-controller will be programmed and used to control the system. |
| **URL** | https://sites.google.com/a/temple.edu/lunabotics/ |

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| **Team SD1-07** | **Visionary Energy Solutions, Inc.**  | **HGSC SC 223 3:40 PM** |
| **Team Members** | Rebecca Hagel, Shawn Meyer, Amar Patel and Daniel Reo |
| **Advisor(s)** | Steve Ridenour |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Energy Modeling to Reduce Energy Consumption |
| **Abstract** | On Temple’s campus, the Biology Life Sciences Building (BLSB) is the leading energy consumer using 830,117 BTU/gsf-yr. This is twice that of the Pharmacy Building, the 2nd highest energy consuming building.  The BLSB has 4 floors consisting of 50 laboratories and 40 classrooms for a total of 168,651 square feet and an occupancy of 800 people. The BLSB will be accurately modeled using Trane software to match that of the empirical data gathered over 7 years by Temple’s energy manager.  The average occupancy per day, lighting requirements, gross square footage, usage of heating, ventilating and air conditioning system will be considered when constructing the model.  To achieve at least a 10% energy reduction, techniques will be implemented and a simulation will evaluate the energy usage. One technique is to use a Coil Energy Recovery Loop (CERL), which will recover the energy from the exhaust hoods.  Currently the HVAC system is using 100% outside air; reducing this will save on the energy demand.  Other techniques will be implemented to maximize the energy reduction. A cost analysis will be executed to determine the practicality of the implications.  The usage of this reduction in energy consumption plan will make the BLSB more efficient.  |
| **URL** | http://sites.google.com/a/temple.edu/ves/home |
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| **Team SD1-08** | **MindGames** | **HGSC SC 205 12:00 PM** |
| **Team Members** | Yuliy Balter, Jason Buranich, Joe Gro and Ilyana Mushaeva |
| **Advisor(s)** | Iyad Obeid |
| **Coordinator** | Joseph Picone |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | A Non-invasive Brain to Computer Interface System for Video Gaming |
| **Abstract** | We propose to study electrical signals produced by the brain and utilize those signals as inputs to a specifically designed video game. Our focus will be on beta and mu waves which are associated with alert/work state of the brain. The brain has neurons which fire off every time we think of doing a movement or when we actually move. The voltages supplied by the neurons are in the micro-voltages which will be read by an electrode cap and then passed through an Electroencephalography machine. By monitoring the voltages between 8-30 Hz, we can orient the peaks with thought patterns and use those as inputs. We will design a dodge ball game utilizing C++ and interface that with a program called BCI2000. BCI2000 is an open source brain to computer interface system used for data acquisition. By designing adaptive filters in BCI2000, we will reduce signal-to-noise ratios and evolve with the user as he/she is playing the game. We will also incorporate a feedback system in which the user will sense the ball getting closer as they visually see it moving closer. We will accomplish this by using a vibration system that will intensify as the ball moves closer. |
| **URL** | http://sites.google.com/a/temple.edu/mindgames |
| **MBA Team** | Ann Dubensky, Teng Cheang, Dalia Mansour and Elizabeth Welsh |
| **MBA Advisor** | Neeraj Bharadwaj |

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| **Team SD1-09** | **Apollo Alternative Heating**  | **HGSC SC 220 2:20 PM** |
| **Team Members** | Ashleigh Baxter, Amanda Branco, Josh Laskin and Laura Solomon |
| **Advisor(s)** | Sandip Shah |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Design and Construction of a Solar Powered Space Heater |
| **Abstract** | Fossil fuel resources emit large amounts of carbon dioxide and other greenhouse gases into the Earth's atmosphere. These resources are harmful to the environment and cannot be renewed. The depletion of these resources and resulting impact on global climate change are of great concern. Apollo Alternative Heating is designing and constructing a heater which will be powered with the assistance of solar energy.  The design consists of a solar collector placed in a window to power a heater connected to a storage tank. The collector must fit into a standard household window and the unit must be able to function without using more than 1kW of electric power. This heater will allow consumers to lower their current heating bill by 10% and will pay for itself in 3 years. The heater must be comparable in size, cost, and performance to a gas or electric powered heater used for a 12 ft. by 12 ft. bedroom or office. To achieve this, the design is based on sunlight conditions for a Northeast latitude location in a south facing direction. |
| **URL** | http://sites.google.com/a/temple.edu/apollo-alternative-heating/ |
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| **Team SD1-10** | **Control Systems, Inc.**  | **HGSC SC 207 1:40 PM** |
| **Team Members** | Timothy Boger, Sadarshan Kandi and Ross Keyes |
| **Advisor(s)** | Chang-Hee Won and Saroj Biswas |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Nonlinear Control of Laser Targeting System |
| **Abstract** | Space Solar Power (SSP) is an alternative source of electrical energy where solar power is collected in space and transmitted to Earth. Presently, due to various atmospheric nonlinearities, it is difficult to align the power transmitting satellite and the receiving rectenna on earth, thus causing a significant drop in efficiency. In order to overcome the uncertainties in aligning a transmission beam, our group intends to implement a nonlinear control algorithm in hardware to simulate an SSP transmission system. In this two part project, we intend to first observe the effects of an industry standard PID controller and then compare it with a statistical controller type developed by Dr. Chang Hee Won of Temple University and his research team. We expect the statistical controller to have better results than the PID controller as it heavily focuses on the optimization of the system. We intend to simulate the satellite system using a laser and a two axis gimbal on a vibration table; and the receiver by a white screen placed in front of a camera. The performance of the two systems will be gauged by their ability to keep the laser dot pointed in a target area. |
| **URL** | http://sites.google.com/a/temple.edu/nonlinear-control-of-laser-targeting-system/ |

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| **Team SD1-11** | **GHV Engineers**  | **HGSC SC 220 1:40 PM** |
| **Team Members** | Thomas Gallen, Jennifer Huber and Paloma Vila |
| **Advisor(s)** | Robert Ryan |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Harvesting Stormwater Runoff for Urban Farm Irrigation |
| **Abstract** | A rainwater harvesting system will be designed for an urban farm located in the Germantown Section of Philadelphia, Pennsylvania.  Rainwater is an important natural resource whose retention, control, and reuse, especially in urban regions, contribute to a healthier environment and financial benefits.  Stormwater runoff results in excess sediment and other harmful pollutants in urban streams and rivers, as reported by the U.S. Environmental Protection Agency.  The proposed rainwater harvesting system will be designed to reduce the levels of heavy metals, phosphorus, and hydrocarbons in the runoff from the 2205 ft2 roof, to a level that meets agricultural water standards.  About 6000 gallons of water will be retained and treated in a natural pool, and any excess will be stored and used to irrigate the one-half acre urban farm when needed.  This onsite treatment of rainwater alleviates the farmer’s dependency on public water resources and reduces their water usage costs.  The system will also reduce the hydraulic load on combined sewers and help improve water quality in streams and rivers by saving and treating at least the first inch, approximately 1400 gallons, of runoff during a storm event. |
| **URL** | http://sites.google.com/a/temple.edu/ghv-engineers/ |
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| **Team SD1-12** | **Car Diagnostics, Inc.**  | **HGSC SC 206 2:20 PM** |
| **Team Members** | Tomilade Adeyemi-Wilson, Ahmed Attalla, Gleb Danilchenko and Christopher Tufts |
| **Advisor(s)** | Dennis Silage |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Multi-Function Touch Screen Display Using Vehicle On-Board-Diagnostics |
| **Abstract** | The concept for the project is to analyze, design and fabricate a portable, handheld embedded processing system which is a diagnostics tool of automotive performance.  The system will utilize a convenient tiered sequence of operations in a graphical user interface (GUI) with touch screen navigation.  The device will display processed information from the standard automotive On-Board-Diagnostics (OBD-II) port.  Available functions will include Miles-Per-Gallon (MPG), a real-time service monitor for automotive performance and analysis, an aberrant error emissions/safety Diagnostic Trouble Codes (DTC) display and a database of past DTCs. The internal combustion or hybrid engine sensor data is available from the OBD-II port as the standardized SAE J1979 protocol using the ISO 15765 Controller Area network (CAN) data bus. Sensor information will be requested by the device from the OBD-II port and processed for display on a touch screen LCD.  The proposed system will consist of a digital communication link between a transceiver attached to the inconvenient OBD-II port (under the dashboard) and the user interface with the touchscreen display. |
| **URL** | http://sites.google.com/a/temple.edu/multifunction-obd/ |
| **MBA Team** | Penny Boonpoon, Sandra Countley, Nyko Torres and Xiaofei Liu |
| **MBA Advisor** | Neeraj Bharadwaj |

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| **Team SD1-13** | **HEATT** | **HGSC SC 223 3:20 PM** |
| **Team Members** | Stephen Barrett, Jonathan Childs, Dean Cun and Emmy Messina |
| **Advisor(s)** | Parsaoran Hutapea |
| **Coordinator** | Richard Cohen |
| **Departments** | Electrical and Computer Engineering, Mechanical Engineering |
| **Project Title** | Development of a Hybrid Fuel Cell Electric Powertrain |
| **Abstract** | Though the negative effects of oil usage continue to grow with increasing demand, the auto industry has yet to find an alternative fuel source with the efficiency and practicality necessary to lower oil use.  In order to further this transition, this project bridges the gap between gasoline and fuel cell technology.  The prototyped power train for this project features an internal combustion generator and hydrogen PEM fuel cell, though neither have been connected to the currently operating system. As a result, these components cannot yet be used to charge the batteries. Also, no battery charging algorithm has been implemented, and the system monitoring the battery charge suffers from interference when the vehicle is running. Our goal is to overcome interference issues while designing and implementing a LabVIEW controlled battery management system (BMS). The BMS will optimize the battery bank’s performance by implementing even charge and discharge cycles across the battery bank, ensuring its continued life and safety. The functional vehicle will provide a model for the potential practicality of a combined gasoline/fuel cell power supply system in transitioning from fossil fuels to emerging fuel technologies.  |
| **URL** | http://sites.google.com/a/temple.edu/fuelcell/ |
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| **Team SD1-14** | **Biosims Technology, LLC**  | **HGSC SC 223 3:00 PM** |
| **Team Members** | Nadia Elkaddi, Thomas Heffernan, Jiacheng Li and David Lin |
| **Advisor(s)** | Nancy Pleshko |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | An Apparatus to Study the Effects of Mechanical Input on Articular Cartilage Growth |
| **Abstract** | Articular cartilage is made up of chondrocytes and an extracellular matrix composed primarily of water, collagen and proteoglycans. Since cartilage is largely nonvascular, chondrocytes rely on the extracellular matrix around it for nutrients. In normal joints, load-bearing areas, in comparison to non-load bearing regions are: thicker, have a higher proteoglycan concentration, contain larger cells, have a greater volume of organelles, and mechanically stronger. This design project will consist of building a loading system for cartilage explants in order to study the mechanical effects of pressure on articular cartilage cells. For the system to be sufficient, it must incorporate an input of 500 psi to 1000 psi, fit in an incubator 3 ft x 2 ft x 2 ft, and utilize LabView to control air pressure. In order to increase the accuracy of lab results, a confined loading system will be used, which will allow the cell explant to be restricted when the loading force is present. A loading system such as this can be used to further cartilage growth using mechano-stimulation research, thereby helping the 20 million people per year inflicted with osteoarthritis. |
| **URL** | http://sites.google.com/a/temple.edu/developing-an-ultrasound-machine-with-variable-intensities/ |

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| **Team SD1-15** | **Team STV**  | **HGSC SC 223 2:40 PM** |
| **Team Members** | Michael Lukas, Noel Prodigalidad |
| **Advisor(s)** | Alex Diloyan, Kevin Carmody and Christopher Holliday |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Diesel Propulsion Drone |
| **Abstract** | During off peak hours, the New Jersey Transit agency has a demand to operate smaller trains consisting of two to four passenger cars.  To fulfill this need, our team will design the foundation for a scaled down diesel propulsion unit.  Since it will be remotely controlled from either end of the train, we can classify the unit as a drone.  It will provide nearly the same capabilities of a conventional locomotive: energy output for passenger luxuries and comforts, and enough tractive effort to drive the train and its load.  Currently, regional rail systems operate light passenger demand trains with multiple unit propulsion systems, MU’s, and inefficient methods involving full-scale locomotives.  Our Propulsion Drone will be a smaller and more cost effective alternative while complying with Federal Regulations and EPA standards.  Some constraints that we will analyze include tractive effort, braking power, and cost efficiency according to a realistic passenger demand. STV Incorporated, an Engineering Consulting firm that works closely with New Jersey Transit, will be providing their information databases for our research and simulation programs in order to develop and test our design. |
| **URL** | http://sites.google.com/site/sdmetrain/ |
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| **Team SD1-16** | **I-LED, Inc.**  | **HGSC SC 220 1:20 PM** |
| **Team Members** | Brian Angelina, Benjamin Bruening, Chris Eckhart and Ercan Kibaroglu |
| **Advisor(s)** | Bill Zhang |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Adaptive Structural Retrofits Using Building Information Modeling |
| **Abstract** | The building industry has undergone significant segmentation since the days of the master builder, and the processes by which Architects, Engineers, and Contractors collaborate are filled with inefficiency and duplicated efforts. Emerging Building Information Modeling (BIM) technology provides a digital platform upon which all involved disciplines are able to collaborate on a single integrated model of the facility, which can be referenced as a living design document throughout the building’s life-cycle. This project examines the efficacy of this technology from an engineering perspective in the design of a structural retrofit for an addition to the Temple Engineering and Architecture Building. We will begin by modeling the existing building structure with Revit, a BIM software program by Autodesk, based on its design documents.  Using RAM Steel, a widely-used structural engineering software program, we will analyze the Revit model and design the building addition. Through research and experience with BIM capabilities, we will evaluate its practical value for structural renovations. BIM is gaining a strong foothold across all sectors of the building industry, and we believe that this project will demonstrate the potential for a more efficient and collaborative building process. |
| **URL** | http://sites.google.com/a/temple.edu/bim/ |

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| **Team SD1-17** | **Enviroland Engineering**  | **HGSC SC 220 1:00 PM** |
| **Team Members** | Tugba Akgun, Daniel Kapral and Rory Sgarlat |
| **Advisor(s)** | Robert Ryan |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | The Performance of an Engineered Wetland to Control Eutrophication |
| **Abstract** | Constructed wetlands may be utilized for wastewater treatment by using a combination of physical, chemical, and biological processes.  We at EnviroLand specialize in the treatment of agricultural runoff waters by way of engineering wetlands.  Agricultural runoff waters contain excessive amounts of nutrients which may lead to a potentially harmful environmental imbalance. Our team purposes an engineered wetland is the most economical way to remedy this problem.  A scale free water surface wetland will be constructed and operated in an in-door laboratory facility with plants and soils indigenous to the Delaware Valley.  The wetland will be contaminated with, and monitored for the uptake of the nutrients Nitrogen and Phosphorus.  The levels of these nutrients in the discharge are not to exceed levels outlined in the Philadelphia Water Department’s Best Management Practices.EnviroLand team members will collect data yielded from the laboratory wetland.  The data will be used in conjunction with site specifics of an area of concern, such as level of nutrient contamination and runoff flow rate.  With this information, EnviroLand may construct a full scale wetland to meet the needs of any area with problematic agricultural runoff.  |
| **URL** | http://sites.google.com/a/temple.edu/enviroland-engineering/ |
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| **Team SD1-18** | **Test Rigs, LLC**  | **HGSC SC 220 12:40 PM** |
| **Team Members** | Abdul Muneem, Matthew Burns, Euill Long and Funmi Ogunlokun |
| **Advisor(s)** | Sandip Shah |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Improved Free-Flow Hydroturbine Performance Using a Ducted Design |
| **Abstract** | In recent years, scientists have become concerned with Global Warming.  Experts agree that increased emissions of greenhouse gases are the catalyst to this volatile situation.  Thus, recent interest in environmentally friendly forms of energy has skyrocketed.  Obviously, the solution to this global problem will be multi-faceted, but we believe free-flow hydro turbines are a step in the right direction.Our design will incorporate a floating platform to harness the hydro-kinetic power potential of rivers.  Attached to the bottom of the platform and submerged in the river will be an environmentally friendly free- flow hydro turbine.  Unlike dams, free-flow hydro turbines do not hamper fish migration or contribute to sediment build up.  Currently, free-flow hydro turbines are primarily limited to rural locations where access to the power grid is unavailable and power demand is low.  Our aim is to improve on the power output of such turbines by designing a ducted system to increase the velocity of the water going through the turbine.  Our ultimate goal is to improve the performance of the non-ducted turbine by at least ten percent, thus making the technology more feasible for small scale power production. |
| **URL** | http://sites.google.com/a/temple.edu/testing-rig/ |

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| **Team SD1-19** | **Fluent Engineering**  | **HGSC SC 223 2:20 PM** |
| **Team Members** | Anthony Gland, Matthew Judge and Lucas Orner |
| **Advisor(s)** | Srikanth Bontha, |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Effect of Coolant Passage Design Parameters on Fluid Pressure and Velocity Distribution |
| **Abstract** | In machining operations, cutting fluids are used for improving cutting performance. The four basic methods for applying cutting fluids in machining operations are: flooding, mist, high-pressure systems and through the cutting tool systems. Cutting fluids increase lubrication, minimize chip breakage, and aid in the removal of heat from the cutting zone. The cutting fluid can perform these functions only if it actually reaches the cutting zone. This study is an attempt to study the effect of coolant passage design parameters such as shape, diameter and angular bends on fluid pressure and velocity distribution at the exit cross-section of the passage. The objectives will be to design a passage that will deliver coolant to the cutting in the most effective way possible. This means a design that will use minimal amount of coolant and achieve maximum cooling results. This will be accomplished using a combination of computational fluid dynamics (CFD) techniques and experiments. Computational work will be carried out by using the fluid dynamics software package Fluent. The numerical results will then be verified with experiments. |
| **URL** | http://sites.google.com/a/temple.edu/fluent-engineering/ |
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| **Team SD1-20** | **Smart Power, Inc.**  | **HGSC SC 206 12:00 PM** |
| **Team Members** | Ajo Maret, Tsuefeng Moua, Yina Shi and Kenny Te  |
| **Advisor(s)** | Saroj Biswas and Frank Ferrese |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Intelligent Reconfigurable Power Grid |
| **Abstract** | Power grids deliver electricity from suppliers to consumers from various power sources. As technology advances, there tends to be excess strain within the grid due to the increase demand in power. Nearly 70% of faults within the grid are of transient type, these faults often self-heal themselves. The remaining faults are due to problems within the components within the grid itself. An intelligent reconfigurable power grid has the ability to reconfigure itself in the event of a failure in order to maximize the reliability and efficiency of the power supply while minimizing cost of components. With a scaled model of Temple University’s Engineering building, we will design a small hardware model to simulate, detect and reconfigure faults within the electrical system. Each design will electronically reconfigure based on the faults detected in the system, sensors and electronic circuit breakers will handle the detection and reconfiguration. Our design will consist of multiple reconfigurations in order to test and obtain accurate results. By designing multiple reconfiguration lines, we can determine the most appropriate method that will ultimately meet our goal. The resulting methodology can be applied to larger scaled power systems since they contain similar constraints but at much larger volumes. |
| **URL** | http://sites.google.com/a/temple.edu/smart-power-grid/ |
| **MBA Team** | Gaurav Mandore, Andrew Master, John Quaile and Meredith Setzman |
| **MBA Advisor** | Neeraj Bharadwaj |

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| **Team SD1-21** | **EIA, Inc.**  | **HGSC SC 206 12:40 PM** |
| **Team Members** | Kenneth Carter, Ryan Hughes and Keyur Vekaria |
| **Advisor(s)** | Saroj Biswas and Jim Chen |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering, Mechanical Engineering |
| **Project Title** | Engine Heat Power Recovery From Thermoelectric Generation |
| **Abstract** | It is a known fact that in most cars only 15 percent of the energy created by a combustion engine is actually used toward powering the vehicle, while the other 85 percent is lost, mostly through heat. Out of this 85 percent, close to half of the energy loss occurs in the radiator of the car. We propose to design a new radiator which utilizes thermoelectric generators (TEGs), which recovers waste heat energy into usable electric energy. TEGs will allow the heat from the engine to be converted into electrical power that will be used to charge the car battery. Our design goals include maximizing the electrical output by increasing the temperature gradient between the two sides of the thermoelectric generator. The larger the temperature gradient, the more energy we can produce. We will also need to maximize the surface area of the generator, find material that can withstand the heat of the radiator, and create a unit that fits into all cars. The Electrical Engineering component of the project will include design of electrical circuit for the thermoelectric modules along with the charging circuit of the battery and power flow analysis. |
| **URL** | https://sites.google.com/a/temple.edu/eia-inc/ |
| **MBA Team** | Natasha Ulianova, Naveen Penmetcha, Chethan Kambi and John Conlon |
| **MBA Advisor** | Neeraj Bharadwaj |
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| **Team SD1-22** | **Bumblebee** | **HGSC SC 207 1:20 PM** |
| **Team Members** | Mubin Ahmed, Yue Liu, Hai Nguyen and Sahaskumar Patel |
| **Advisor(s)** | Chang-Hee Won |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Indoor Aerial Autonomous Coaxial Rotorcraft |
| **Abstract** | One of the most exciting events of the year called Indoor Aerial Robotic Competition (IARC) sponsored by Drexel Autonomous Systems Lab (DASL). Our senior design project is based on this event, we will be programming a autonomous rotorcraft and compete in 2011’s tournament. The goal of the project will be to follow a black line with of 8 inch wide. We will need the rotorcraft to maneuver through a pathway with obstacles such as model trees and poles and building. There are low speed fans setups at the end of pathway, so we will calculate the wind resistance against the rotorcraft. Our final goal of the competition is to mark the location of victims and transmit a live video feed to receiver’s laptop. In order to maker the location with accuracy of 100% we will be implanting an image processing technology. The video camera will be coded to recognize a human victim and give an exact location. Based on how accurately we provide the location we will be awarded point thus wining the competition. We can consider our design as a prototype for a search and rescue mission, it can be used for military purposes. |
| **URL** | http://sites.google.com/a/temple.edu/autonomous-blimp/ |

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| **Team SD1-23** | **Medical Devices, Inc.**  | **HGSC SC 206 1:20 PM** |
| **Team Members** | Jon Lester, Enea Mile and Syed Fehr |
| **Advisor(s)** | Zdenka Delalic |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Implantable Blood Pressure Monitor |
| **Abstract** | The goal of this project is to develop a convenient and more effective way of monitoring blood pressure. Current ambulatory home monitors are cumbersome. They offer limited memory storage, require lots of power, and can make sleeping difficult for users due to their constricting setup. An implantable blood pressure monitor would eliminate many of these common issues, as well as allow for a more efficient way for cardiologists, or general practitioners to better monitor patients' conditions. Implanting the device would require only a minimally intrusive surgery, placing the device in an artery close to the body, such as the subclavian artery, located behind the clavicle. This would allow for much more accurate readings, as it minimizes inaccuracy due to the constriction of blood vessels resulting from cold temperatures. A feasible prototype would consist of a blood pressure sensor attached to a wireless transmitter. The receiver displays the readings on a small LCD screen, and should be able to function with a range of several feet from the implanted device. Power is the technical challenge behind this as an ideal implanted device should be as energy efficient as possible. Our device would only use power when signaled to record a reading. The prototype will record and display a pressure reading only on command, so as to maximize power efficiency. |
| **URL** | http://sites.google.com/a/temple.edu/design-project/ |
| **MBA Team** | Philly Zhang, Charissa Fahnestock, Mahesh Sharma and Steve Lauer |
| **MBA Advisor** | Neeraj Bharadwaj |
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| **Team SD1-24** | **Second Generation Systems**  | **HGSC SC 223 1:40 PM** |
| **Team Members** | Dat Duong, Jennifer Bullock, Ishmael Kamara and Douglas Johnson |
| **Advisor(s)** | Alex Dlioyan |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Enhanced Wind Turbine Performance using Compliant Rotor Technology |
| **Abstract** | R2 Engineering has been funded by Piasecki Aircraft Corp. to quantify the benefits of certain wind turbine design approach and to develop a micro-scale embodiment using that approach. This approach uses a non-traditional rotor and nacelle layout which emphasizes the freedom of the rotor to move while running but also allows the rotor to be attached to the tower during high winds. These two techniques allow the rotor to avoid both the most frequent running load and the rare load spikes which currently limit rotor design. If successful these load reduction techniques will allow a significantly larger rotor area, increase production and decrease intermittency. The rotor proportions specified by Piasecki would increase Annual Energy Production by 20%, and reduce average blade root bending stress by 15%. The power curves and blade root bending histograms of an unmodified commercially available wind turbine will be compared with those of the rotor that has been modified by the team to use this advanced rotor system, using that same turbine. This comparison will ensure that Piasecki's approach mitigates the usual exponential increase in stress which accompanies an increase in rotor diameter. |
| **URL** | http://sites.google.com/a/temple.edu/windturbineretrofitproject/ |

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| **Team SD1-26** | C.U.R.V. Engineering | **HGSC SC 223 1:20 PM** |
| **Team Members** | Pamela Kobylkevich, Karl Lewis and Edward Wienckoski |
| **Advisor(s)** | Vallorie Peridier |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Optimizing Damper Stiffness in Formula Racecars Using MR Fluid |
| **Abstract** | The primary objective of this research is to design, implement, and test a semi-active suspension control system for a Formula Racecar.  The proposed system will actively monitor the pitch and lateral acceleration of the racecar and respond by dynamically adjusting the viscosity of the dampers so as to maintain stability and provide a smooth ride.  The dampers will incorporate a magneto-rheological (MR) fluid, whose viscosity can be almost instantly varied by varying the applied voltage.  The lateral accelerations of the car will be measured using an accelerometer, filtered using digital signaling processing techniques, and then used to adjust the viscosity of the MR damper.  The control system will be programmed to increase damping with increasing lateral acceleration.  The complete suspension control system will be implemented using a on board small microprocessor.  We will be using a Formula SAE car to test the performance of the proposed dampers.  By comparing lap times in on test tracks (a conventional track and a small circular track) we will be able to quantify the improvement due to the MR fluid dampers over conventional dampers with the goal of decreasing lap times by 2-5%. |
| **URL** | http://sites.google.com/a/temple.edu/semi-active-dampers/ |
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| **Team SD1-27** | **RF Locators** | **HGSC SC 206 3:00 PM** |
| **Team Members** | Safiyah Abdul-Malik, Clarence Augustin, Michael McCollum and William Maignam |
| **Advisor(s)** | Zdenka Delalic and Fatehy El-Turky |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Universal Remote Locator Device Using an RF Transmitter and Receivers |
| **Abstract** | Misplacing important day-to-day items is very inconvenient, and it is even more frustrating to frantically search for these items at a time when you need them immediately. At one point or another, we all fall victim to being disorganized and misplacing our personal belongings (wallets, car keys, TV remote, etc.), but it should not negatively impact our daily routine by making us late for work or other appointments. We propose to address this problem by designing a universal remote locator device. This wireless device will consist of a radio frequency (RF) transmitter with multiple receivers that can be attached to your personal belongings which may become misplaced. Pushing a particular button on the transmitter will send a signal to a corresponding receiver causing it to beep for a period of time so that the user can locate it. This is similar to how the alarm for a household cordless phone works, except this device will be applicable to almost any item within your household. This system will be wireless and battery powered, as well as being compact enough to conveniently fit onto your items. |
| **URL** | http://sites.google.com/a/temple.edu/remote-location-detection-device/ |
| **MBA Team** | Hanh H. Han, Sean McGowan, Nick Flynn and Josh Margolis |
| **MBA Advisor** | Neeraj Bharadwaj |

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| **Team SD1-28** | **Advance AR**  | **HGSC SC 206 3:40 PM** |
| **Team Members** | Thomas Driscoll, Fei Lin, Viral Patel and Thuan Nguyen |
| **Advisor(s)** | Fatehy El-Turky |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Data Glove Gesture Recognition for Augmented Reality Applications |
| **Abstract** | As an increasing amount of technology focuses on enhancing human interaction with our surroundings, user-wearable data gloves are being designed to track and recognize intuitive and convenient gestures that are used to trigger functions. By reacting to relative acceleration and velocity motions, gesture recognition algorithms overcome errors inherent to absolute position tracking algorithms that are the result of inaccurate distance measurements accumulating over time. The need to determine orientation with respect to the gravitational axis is also eliminated by fusing multiple accelerometers and comparing their output signals to those generated by programmed gestures. Gestures may then be characterized by parameters like magnitude or time for better, proportional control over a given function. The affordability of modern MEMS accelerometers makes low-cost implementation possible and will likely drive the availability of interfaces to data gloves. Wireless data transmission in combination with the small accelerometer size minimizes restriction on user motion and allows a compact final hardware package. Applications are limitless and include remote robotic control, gaming, and use as a computer peripheral. |
| **URL** | https://sites.google.com/a/temple.edu/dataglove/ |
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| **Team SD1-29** | **SCC, Inc.**  | **HGSC SC 220 12:20 PM** |
| **Team Members** | Breanna Kovach, Grant Leonhard, Fabrice Benoit and Ahmadi Khalil |
| **Advisor(s)** | Felix Udoeyo |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Predicting Moment and Shear Capacities of SCC Using Dimensional Analysis |
| **Abstract** | Self-consolidating concrete (SCC) is a new concrete whose application is expected to grow rapidly in the future because of its reduction in labor cost, construction time, and noise level on the construction site. The use of cement kiln dust (CKD) as a replacement for Ordinary Portland Cement (OPC) also reduces the material cost since the CKD is a waste material. The objective of this research is to develop a predictive model for the moment and shear capacity of SCC made with various amounts of CKD.A control mixture composed of 100% OPC will be used in order to compare the strength of the mixtures. Four other mixtures will be produced ranging in increments of 10% from 10-40% CKD with 90-60% OPC. Testing of these samples will involve the use of a universal strength testing machine as well as a slump flow, L-Box, V-funnel, U-Box, J-Ring, and static segregation test, all in accordance with ASTM standards. The strength requirement that the mixtures need to meet is 3500 psi. Ideally the strength requirement should be met while using the highest percent of CKD as to reduce cost.Using our research results, practicing engineers and construction professionals will be able to custom tailor concrete design mixes to balance functional performance with CKD substitution based on their application. |
| **URL** | http://sites.google.com/a/temple.edu/self-consolidating-concrete/ |

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| **Team SD1-30** | **Concrete, Inc.**  | **HGSC SC 220 12:00 PM** |
| **Team Members** | Haitham Mohammad, Priyank Patel, Evan Shepard and Stuart Shepard |
| **Advisor(s)** | Felix Udoeyo |
| **Coordinator** | Sandip Shah |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Evaluating CKD in Self-Consolidating Concrete Mixtures |
| **Abstract** | Cement kiln dust (CKD) is a waste removed from cement kiln exhaust.  Cement industries generate between 13 and 17 million tons of CKD per year, of that, around 1.5 million tons of CKD are disposed of into landfills every year.  There has been limited research performed on this waste product and its practical engineering uses.  This project will further our understanding of the effects of cement kiln dust in light-weight self-consolidating concrete (SCC) mixes.For our research we will design one control mix with 0% CKD/Slag Cement and 100% Original Portland Cement (OPC), and then 4 more mixes consisting of 80% OPC with varying CKD to Slag Cement ratios: 0%;20%, 5%;15%, 10%;10%, and 15%;5%.  We will prepare 6”x12” and 4”x8” cylinders to perform 5 ASTM tests to determine the compressive/ split tensile strengths, sorptivity, porosity, and water absorption tests.  We will use 3 specimens per test for all 5 mixes plus testing on the 1st, 3rd, 7th, and 28th day of curing for strength tests giving a total of 165 specimens.  All mixes will be designed for a minimum compressive strength of 3000psi. |
| **URL** | http://sites.google.com/a/temple.edu/strength-porosity-and-corrosion-of-self-compacting-lightweight-concrete-containing-ternary-blended-binders/home |
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| **Team SD1-31** | **Tesla** | **HGSC SC 207 1:00 PM** |
| **Team Members** | Yauheni Haluza, Maninder Sehgal, Gregory Tedesco and Robert Komulainen |
| **Advisor(s)** | Thomas Sullivan |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Vehicle Magnetic Field Reduction for Mine Protection |
| **Abstract** | Degaussing is a process which is used in order to reduce a known, unwanted magnetic field.  For the purposes of our design, we wish to apply this technique to counter explosive mines, which utilize electromagnetic distortion sensors to detect unsuspecting military tanks and vehicles.  Our main objective is to design a degaussing mechanism that will generate a counter-magnetic field to offset the natural field created by a tank, as the tank is composed of highly ferromagnetic materials.  Doing so will conceal the tank’s magnetic presence from the mine’s sensors.  We will develop a prototype degaussing mechanism based on a scale-size model of a ferromagnetic vehicle.  The model device will have to fit within a volume of .5 cubic feet and consist primarily of a battery power source and current-carrying coils oriented accordingly as to generate the necessary counter magnetic-field.  The battery will be rated at 18 volts and 2.5 amp-hours.  A possible expansion to this problem would be to design a circuit that can compensate both the amount and direction of the current through the coils, for situations where the surrounding environment invokes EM interference. |
| **URL** | http://sites.google.com/site/vehicledegaussing/ |

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| **Team SD1-32** | **Yager Motor Company**  | **HGSC SC 223 1:00 PM** |
| **Team Members** | Robert Nazian, Kyle Parkins, Robert Pennock and Sean Selkregg |
| **Advisor(s)** | Richard Cohen |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Testing of Yamaha Genesis 80FI Engine for the Formula SAE Racecar |
| **Abstract** | The main objective of this project is to successfully tune the Yamaha Genesis 80FI engine and its components for Temple's Formula SAE race car. Our main goal is to maximize torque output of the engine without compromising the safety of both the engine and the driver. In order to maximize torque, we plan on using a turbocharged system which will deliver more air to the engine. However, this can lead to a problem that many other teams experience when using turbochargers called detonation. The methods to avoid detonation are currently being researched; these include, adjusting the compression ratio of the engine, use of a higher octane gasoline, or using an alcohol fuel mixture. Also, the engine we have chosen is unique in that it has a continuously variable transmission. The method of coupling this unique transmission to the rear differential is currently being researched. Our present plan is to run the belt drive to a secondary shaft where a roller chain will be connected which will transmit the torque to the rear differential. We expect to have the engine mounted and ready for testing by spring semester. |
| **URL** | http://sites.google.com/a/temple.edu/engine-application-for-formula-sae-vehicle/ |
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| **Team SD1-33** | **Shockwaves, Inc.**  | **HGSC SC 223 12:40 PM** |
| **Team Members** | Francis Bolger, Raymond Cornely and Benjamin Sauers |
| **Advisor(s)** | Kurosh Darvish |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Development of a Shock Tube for Research in Traumatic Brain Injuries |
| **Abstract** | Over the past few years, research has begun to answer the question as to whether or not shock waves of reasonable strength could potentially cause traumatic brain injury (TBI).  Our project will entail building a shock tube large enough to produce a shock wave, approximately 100 psi and lower, in a controlled environment within the engineering building for testing purposes. The shock wave will be delivered to the head of an anesthetized rat in order to determine the effects, if any, on the brain tissue. Sound proofing will be required to reduce the noise vibrations produced by the system so as not to interfere with other experiments within the immediate area. The requirements of the system and the constraints of the building will require us to apply our knowledge of machine design, finite element analysis, and acoustics to develop a safe and operational product capable of producing the desired results. Success of the system will allow for the expansion of research in this particular field at Temple University. |
| **URL** | http://sites.google.com/a/temple.edu/shockwave-formation/ |

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| **Team SD1-34** | **Rodent Exercise Inc.**  | **HGSC SC 223 12:00 PM** |
| **Team Members** | Heera Jose, Tanya Singh, Tim Starosta and Angela Thomas |
| **Advisor(s)** | Mohammad Kiani and Bin Wang |
| **Coordinator** | Richard Cohen |
| **Departments** | Mechanical Engineering |
| **Project Title** | Low Cost Device for Testing Aerobic Performance in Rodents |
| **Abstract** | Myocardial Infarction is a major health concern in industrialized countries.  Rodents are often used to test various treatments for myocardial infarction. A known method for testing their recovery is by monitoring the rodents’ heart functioning before, after, and during aerobic exercise which is performed with a treadmill and monitoring equipment.  We will be designing a model for a one lane rodent treadmill which will assist in the aerobic exercise and monitoring recovery from myocardial infarction.  Existing market treadmill machines range from approximately $5,000 to $10,000.  One of our goals is to decrease the price of this otherwise significantly expensive equipment by altering the design and materials, keeping it under $1,000. We will create the ability to monitor speed of movement, angle of inclination, length of time exercising, and a hook-up capability for EKG and heart rate monitoring.  Some goals of the project include: inclination to 45⁰, maintaining a constant speed with an error less than 20%, USB capability with data transfer to the computer, and width-adjustable lanes.  If our goals are reached, a more cost-efficient product will be produced which will be available to many researchers to further progress in current medical issues.  |
| **URL** | http://sites.google.com/a/temple.edu/rat-treadmill/home |
| **MBA Team** | Rohan Sharma, Gerard Callan, Elaf Abu Alsamh, Jennifer Cooperman and Jon David |
| **MBA Advisor** | Neeraj Bharadwaj |
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| **Team SD1-35** | **sketch-N-eers**  | **HGSC SC 207 12:40 PM** |
| **Team Members** | Joshua Deleon, Riaz Jabar, Tuan Phan and Bradley Williams |
| **Advisor(s)** | Seong Kong |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Biometric Detection for Improved University Attendance |
| **Abstract** | In a university setting, lecture halls are an efficient way for an institution to construct classes with a large student body. Although these facilities provide ease for the university to organize a large amount of students, there is a dilemma with attendance. Several attempts to take attendance, such as passing around a sign in sheet, physically calling out roll, or swiping  an ID result in either forged attendance, or valuable class time wasted. Our senior design team will design a system to be implemented in the lecture hall setting that takes a student’s fingerprint for attendance. This system will consist of four main components; a fingerprint reader, software for capturing and creating the fingerprint image, a database to organize the information, and a graphical user interface (GUI) that will provide a user friendly template. By providing this alternative to roll taking, our goal is to cut down attendance time by approximately 7 minutes per class.  Each device will cost around $180-200 and will operate for 60,000 hours which is more than 6 years. Ultimately, our main focus is to increase class time so students can learn what they need to better prepare them for the outside world.  |
| **URL** | http://sites.google.com/a/temple.edu/sketch-n-eers/home |

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| **Team SD1-36** | **SHEPO**  | **HGSC SC 207 12:00 PM** |
| **Team Members** | Greg Wells, John Zebly, Donovan Bolger and Xuhui Liu |
| **Advisor(s)** | John Helferty |
| **Coordinator** | Frank Higgins |
| **Departments** | Electrical and Computer Engineering |
| **Project Title** | Sub-Orbital High Energy Particle Observer |
| **Abstract** | Gamma rays and X-rays are serious forces that attack space hardware and affect human space flight.  These forces create noise interference and their energy can destroy electronics on satellites as well as present health-hazards to humans. Knowledge of the flux of gamma rays and X-rays in space will help us prepare space hardware and human space flight for this dangerous climate.  The goal of this project is to detect the flux of unfiltered gamma rays and X-rays into the thermosphere.  To do this, we will utilize a cylindrical payload space , 9” in diameter and 4” high, on board a NASA Terrier-Orion sounding rocket launching out of Wallops, VA. With our payload, we will collect data of high-energy particles through the use of a scintillator and photo-multiplier. The particles we are interested in measuring are those containing energy levels upward of 100keV. After correlating their pulse-widths and voltages , these particles could give us more information about their source. Prior to launch, we will test and characterize our measurement device within the Temple Physics department as to verify the observed readings are accurate. Our goal is to gain a greater understanding of high-energy radiation that affects space exploration and telecommunications. |
| **URL** | https://sites.google.com/a/temple.edu/shepo |
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**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)**

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| **Team SD2-01** | **Urban Wind Engineering**  | **HGSC SC 205 3:40 PM** |
| **Team Members** | Josef Argenio, Jeremiah Gonzalo, Jesse Harper and Besik Mamistvalov |
| **Advisor(s)** | Michel Boufadel, Sandip Shah and Joseph Picone |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Harnessing Wind Energy for the Integration of Sustainable Energy |
| **Abstract** | Wind energy is a renewable, alternative energy source that is in constant supply. Although initial capital costs are high, wind energy is one of the cheapest forms of electricity generation to maintain after the initial investment. UW engineering installed a wind turbine on top of the newly reconstructed McGonigle Hall Building, on Temple University’s Main Campus, in order to generate power harnessing the wind. There were many design constraints that governed the size and layout of the system. Computational Fluid Dynamics (CFD) software (Meteodyn Inc.) was utilized to analyze wind flow around the structures and the turbines installation site. Data for CFD modeling was obtained over a 500-meter radius area around McGonigle Hall. Model results were used to determine size, type, and orientation of the system, such that power output and return on investment were optimized. Wind speed monitoring at the installation location was used to confirm the results of CFD modeling.  The installed turbine is currently producing power sufficient to run the treadmills inside the newly constructed fitness center at McGonigle Hall. |
| **URL** | https://sites.google.com/a/temple.edu/urbanwind/ |
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| **Team SD2-02** | **2KX Engineering**  | **HGSC SC 205 3:20 PM** |
| **Team Members** | Mamadou Doumbai , Gary Nowicki,  Reggie Pierre and Travis Stanczyk |
| **Advisor(s)** | Michel Boufadel, Sandip Shah and Joseph Picone |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Renewable Energy Using High-Efficiency Turbines |
| **Abstract** | Due to the increasing costs of energy, and the higher demand to move towards green technology, a wind turbine has been installed on top of the Engineering building on Temple University’s Main Campus. The wind turbine has successfully reduced the total cost of electricity for the building, and has also reduced the stress on the power grid. Using wind modeling software, it was determined that the most efficient turbine for the building was a 250Kw rated vertical axis wind turbine. The software also helped in the exact placement of the turbine, which in turn allowed for maximum efficiency and profit. With its current location the wind blows at an average speed of 13.44 mph. This means the turbine produces 49,696KWH per month and saved the University $59,698 a year. A varied amount of energy was stored in a battery storage system that was installed to hold any excess power produced by the system to be used during peak hours of energy consumption. The turbine cuts the total energy usage of the building by 15%, and at this rate will pay for itself in 8.6 years. |
| **URL** | https://sites.google.com/a/temple.edu/2kx-engineering/ |

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| **Team SD2-03** | JABLANK Solar Industries: Hardware Division | **HGSC SC 205 3:00 PM** |
| **Team Members** | Kevin Choi, Noura Abu Al Faraj, Justin Felici and Brenton Smith |
| **Advisor(s)** | Sandip Shah |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | Solar Concentrator: An Angled Attack on the Energy Crisis |
| **Abstract** | JABLANK Solar Industries would like to offer the public a reliable, natural and inexpensive way to provide energy.   JABLANK believes that the only resource that could meet the requirements of our society is the sun; after all, it has provided our planet with nutrients and energy for millions of years.  JABLANK plans to employ the sun's solar energy to offer home and business owners a portable, lightweight solar concentrator that can be modified for just about any application.JABLANK’s solar concentrator has the ability to track the sun’s movement at all times throughout the day, which will be accomplished by utilizing light diodes and an innovative control program that auto-calibrates to the sun’s rays.  The benefit of dual axis movement enables the solar concentrator to track and tilt towards the sun’s energy, which allows for optimum recovery.  This device will be comprised of an array of small mirrors angled at a 45 degree angle to concentrate the energy to a unified focal point.  It will weigh less than fifty pounds and cost less than $300 in order to meet our customers’ needs.  The achievement of this exciting new ‘green’ technology will cut energy costs dramatically and run self-sufficiently, allowing you to live your life with no interruption. |
| **URL** | https://sites.google.com/a/temple.edu/jsi-h/ |
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| **Team SD2-04** | JABLANK Solar Industries: Innovative Controls Division | **HGSC SC 205 2:40 PM** |
| **Team Members** | Andrew Bernd, Lamar Hume and Andrew Kulp |
| **Advisor(s)** | Sandip Shah |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering, Mechanical Engineering |
| **Project Title** | Solar Concentrator: Improving the Efficiency of Solar Collection |
| **Abstract** | With today’s society focused on the “green” revolution, solar energy is a technology that needs to be incorporated into widespread residential application.  Stationary solar panels are the most common and readily available collecting devices.  Unfortunately, with their commonality, the stationary characteristic requires more collection panels to compensate for the panel’s less than optimal placement throughout the day.  Fixed panel placement is the prevailing installation method.  Current installation methodology precludes the panels from tracking the sun throughout the day.  With our solar concentrator, the optimum collection point would be maintained continuously and increase the amount of energy/electricity generated.  Combining solar sensors and cells with the use of small motors permits our concentrator to increase the efficiency of collection by focusing sunlight onto a solar cell.  With regional and seasonal variants incorporated, the ideal design will collect a greater percentage of sunlight and maximize panel utilization reducing the typical surface area requirements for installation. With an ideal outcome, our solar concentrator will permit the efficient collection of solar rays with less surface area producing the same or greater energy production.  Homes will no longer have to cover a large portion of their roofs with solar panels and still maintain efficient solar collection. |
| **URL** | https://sites.google.com/a/temple.edu/jsi-s/home |

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| **Team SD2-05** | **Wind Gen**  | **HGSC SC 205 2:20 PM** |
| **Team Members** | Waqas Ahmed, Nathalia Garcia-Acosta, Brandi R Heard and LyChou Kouai |
| **Advisor(s)** | Saroj Biswas and Jim Chen |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering, Electrical and Computer Engineering,Mechanical Engineering |
| **Project Title** | Wind Turbine Blade Pitch Control |
| **Abstract** | Wind energy production is one of the cleanest ways to produce energy and it is growing at a rate of 30% annually. This way of producing energy has several aspects that need to be considered for it to be efficient. These aspects are, but not limited to: size of turbine, location, control system and orientation of turbine blades. This project will focus on the wind turbine pitch control. In wind energy conversion systems, one of the operational problems is the changeability and discontinuity of wind. Several control techniques have been applied to improve the quality of power generated from wind turbines. On advanced efficient turbines, the pitch, or angle of attack, of the massive rotor blades can be controlled to optimize the power output, without exceeding the turbine's performance limits. The blade pitch control has been used in practice to reduce the overloading of wind turbine when higher wind speeds are available. This actively regulates the torque generated by the wind turbines. This project will focus on an efficient pitch control method, especially for variable-speed wind turbines. |
| **URL** | https://sites.google.com/a/temple.edu/windgen/ |
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| **Team SD2-06** | Engin-Airs Industries | **HGSC SC 205 1:40 PM** |
| **Team Members** | Robet Hughes, Jason Isles, Joseph Martin and Marc Pisarek |
| **Advisor(s)** | Alex Diloyan |
| **Coordinator** | Joseph Picone |
| **Departments** | Mechanical Engineering |
| **Project Title** | A High Efficiency Oil Circulation System for a Windmill Gearbox |
| **Abstract** | To replace fossil fuels the efficiency of clean and renewable energy must be increased. Our project will make wind energy cheaper by lowering the maintenance costs attached to gearboxes. Oil circulation keeps the gears from overheating while filtering wear particles. Windmill gearboxes are located in the cell, which sits on top of the tower 330ft above the ground, experience temperatures from  -20o C to 40o C and use ISO 320 lubricant with a viscosity of approximately 300 centistokes at 40oC. These cells last 20 years but have to be serviced every 6 months. Current oil systems are hard to access and expensive to maintain. Our new system will decrease maintenance costs by reducing maintenance recurrence to once every 8 months. We will design a system using pressure-fed lubrication, where oil is circulated by a shaft-driven pump, filtered and delivered under pressure to the gears and bearings. The system will: use jets to positively direct oil to the locations where it is required; remove wear particles by filtration; not lose efficiency due to churning of an oil bath; remove heat more effectively through use of an oil cooler; and allow for intermittent lubrication when the machine is shut-down if on standby. |
| **URL** | https://sites.google.com/a/temple.edu/oil-circulation-system-for-windmill-gear-box/home |

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| **Team SD2-07** | **Percolators, Inc.**  | **HGSC SC 205 1:20 PM** |
| **Team Members** | Lassey Mensah, Jenna Marie Reedy Rene Santin and Ruslan Voshchilo |
| **Advisor(s)** | Robert Ryan and Benoit van Aken |
| **Coordinator** | Joseph Picone |
| **Departments** | Civil and Environmental Engineering |
| **Project Title** | The Percolator Project: Providing Developing Nations With Low Cost Drinking Water |
| **Abstract** | There are currently over 884 million people who lack access to safe drinking water, and people often trek long distances for poor quality or contaminated water. Current solutions involve chlorination or filtration, however these methods do not use local resources and cannot be repaired or maintained locally, are single use only or are costly and difficult to implement. A filter with a simple design that utilizes readily available local resources to remove waterborne pathogens effectively would help provide clean access to millions of people. A two stage filter was designed that would meet the previous criteria. A sand pre filter as used to pre treat the water, remove suspended solids and some bacteria, while a membrane removed the remaining bacteria. The filter was tested by running pre-contaminated water and testing the water before and after the sand pre filter as well as the membrane for E. Coli and other indicators of water quality. This was repeated until the water coming out of the filter was no longer fit to drink. The process was repeated several times in order to determine the useful life of the filter. |
| **URL** | https://sites.google.com/site/thepercolatorproject/ |