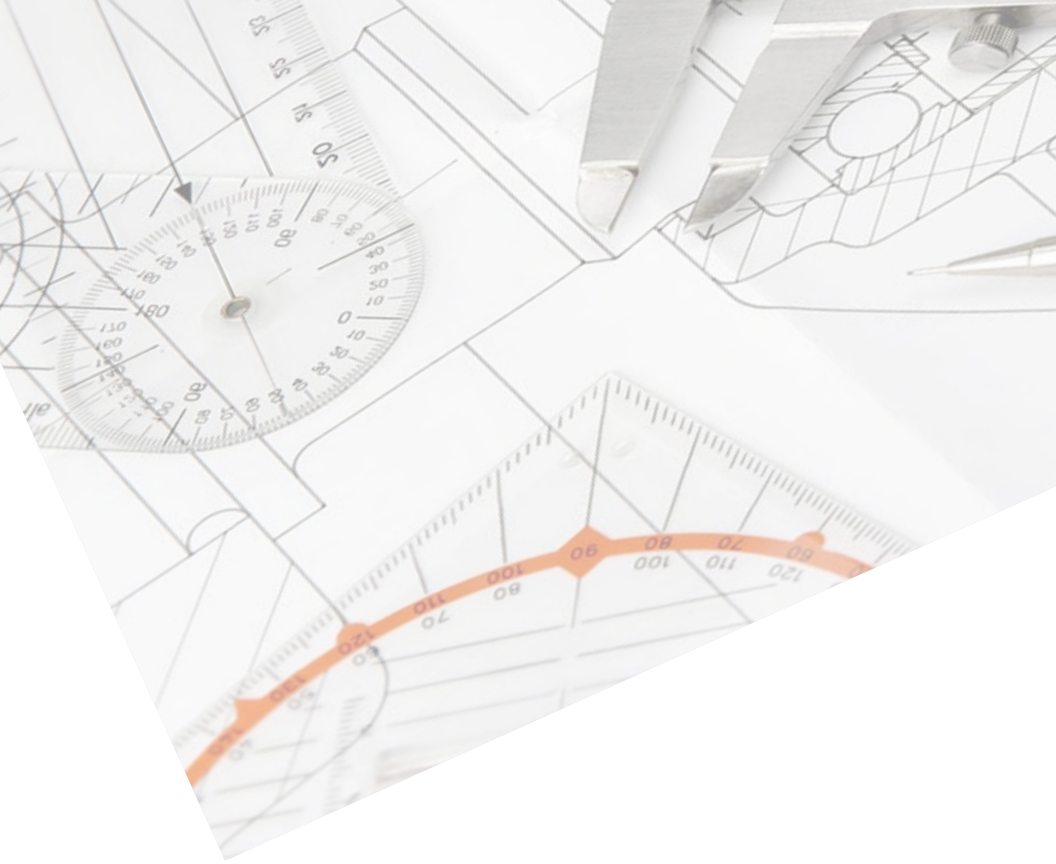
SENIOR 2020
PROJECTS CONFERENCE

PREPARING ENGINEERS AND SCIENTISTS FOR TOMORROW

LOUISIANA TECH UNIVERSITY

COLLEGE OF ENGINEERING & SCIENCE



CONTENTS

BIOMEDICAL ENGINEERING

1:00 IESB 224

SUDEPSense

Sudden unexpected death in epilepsy (SUDEP) accounts for 8-17% of deaths among patients with epilepsy, primarily affecting patients with drug-resistant epilepsy. It is believed that SUDEP occurs as a result of life-threatening cardiac arrhythmias, which may arise from functional impairment of neurocardio (brain-heart) communication. We proposed creating an algorithm that uses EEG and ECG data to monitor a patient's susceptibility to SUDEP. If a patient was determined to be in a state of heightened susceptibility to SUDEP, a warning would be administered for timely medical intervention. Our algorithm establishes a patient-specific, clinically acceptable threshold of neurocardio communication which is determined from analysis of a 2-hour baseline period. The patient is then continuously monitored in real-time. If neurocardio communications fall below the minimum threshold, the patient is notified within 20 minutes via our graphical user interface that they are in a state of heightened susceptibility to SUDEP and that medical intervention should be sought. Our algorithm was executed on data from four patient's stays in an epilepsy monitoring unit and produced promising results for the future of the product. We hope for our diagnostic algorithm to be implemented into a take-home portable device in the future, improving clinical outcomes and quality of life for patients and families alike.

Team Name: SUDEPSense
Team Members: Alexandria Baldizon, Jason Haddad
Sponsor: Brain Dynamics Lab, Louisiana Tech Universit with Dr. Leon Iassemidis
Advisor: Dr. Patrick O'Neal

1:25 IESB 224

SepSafe Early Sepsis Detection

Sepsis is a widespread, potentially life-threatening response in the body to an infection. It is the leading cause of death after a burn injury, causing up to 84% of deaths in adult burn patients. Early detection of sepsis is critical; however, diagnosis in burn patients is more complicated due to the presence of the postburn hypermetabolic response overlapping with typical clinical indicators of sepsis.

To address this, the team, with much help from Dr. Eric Sherer, has used physiological data from the MIMIC-III clinical database to create a predictive computer model that uses logistic regression to analyze a patient's recorded vital signs and predict whether or not the patient will develop sepsis. From our calculations, breathing rate and heart rate data give the most significant prediction of sepsis onset. The interaction of heart rate and breathing rate (HR+BR+(HR*BR)) reduces statistical deviance the most.

Our model focuses on each patient's first three hours' worth of data and averages it to get a truer value and minimize effects of outliers. This will give a prediction of at least 90% accuracy within three hours. This project's purpose is to create a predictive medical device that will reduce serious infections or fatalities resulting from sepsis in burn patients by providing healthcare professionals with an immediate, accurate prediction of sepsis development.

Team Name: SepSafe
Team Members: Joshua Haire, Hannah Harper
Sponsor: Eric Sherer, Ph. D., Louisiana Tech University
Advisor: Dr. Randall Null

BACK TO CONTENTS

BIOMEDICAL ENGINEERING

1:50 IESB 224

RapidPro

It is estimated that between 10-20% of Americans will experience a psychogenic non-epileptic seizure sometime in their life, and 2-71% of these will be misdiagnosed as an epileptic seizure. This is due to the fact that epileptic seizures and non-epileptic seizures have similar signs. This can lead to antiepileptic drugs being prescribed to those having a non-epileptic seizures which can have serious side effects. During an epileptic seizure protein prolactin is released by the pituitary gland. Normal human prolactin levels are near zero at 0 to 3 ng/ml in males and nonpregnant females, during an epileptic event, levels can get up 30 ng/ml. Our team is fabricating a handheld device that will assist medical professionals in diagnosing epileptic seizures. For this project, the handheld device must be able to detect a color change between the different levels of prolactin caused by a reaction to prolactin antibodies and horseradish peroxidase. By performing repeated tests of the color change, we have demonstrated that real-time changes of the prolactin levels can be detected through the color change of the Elisa test strip using a color sensing element. In our preliminary trails, we were able to perform the testing in under one hour. This is a huge improvement to the current blood testing method that can take 24 hours. This method of determining prolactin levels shows promise in distinguishing between epileptic seizures and non-epileptic seizures. This can save patients from receiving false diagnoses and allow them to receive the treatment that they truly need.

Team Name: RapidPro
Team Members: Warren Dangerfield, Cole Forbes, Thomas Holland
Sponsor: John Grady, M.D. (Tech '09)
Advisor: Dr. Gergana Nestorova

2:15 IESB 224

JoeyJacket

Babies born prematurely are underdeveloped and need constant medical assistance and supervision because they lack the ability to self-regulate. Current medical devices do not account for the physiological challenges of premature babies, such as their delicate skin or need for direct skin to skin contact with the mother, which aids in the early development of the child. To address current clinical needs the JoeyJacket was developed, a nearly wireless monitoring vest that utilizes adhesiveless electrodes and a compact temperature sensor with minimal skin coverage. Our team achieved this through the integration of Maxim MAX30205 temperature sensor, Texas Instrument ADS1293 Analog Front End (AFE) for ECG, adhesiveless fabric-embedded electrodes, and an Arduino Uno. These components were consolidated within a cotton jacket with a separate compact processing unit with a single connecting wire. To determine equivalency of JoeyJacket readings to clinical standards, MATLAB was used to determine signal output variance between the two. The AFE and adhesiveless electrodes produce a signal with a coherence to clinical standard sensors less than 0.75 while reducing child discomfort and abrasions. The JoeyJacket is designed to provide accurate and precise ECG, respiratory rate, and temperature readings while considering the sensitivities of a premature neonate. Although neonates are classified as a rare disease population, the clinical need of the JoeyJacket still exists and will support future generations.

Team Name: JoeyJacket
Team Members: Emil Fonseca-Caceres, Tosh Morgan, Marissa Nguyen, Brandice Taylor-Tilley
Sponsor: Sensoria Health
Advisor: Dr. Patrick O'Neal

BACK TO CONTENTS

2:40 IESB 224

DuaSock: Ulcer-Predicting Smart Socks

Hundreds of millions of people around the world have some medical condition that puts them at risk of developing ulcers on the sole of the foot. The most significant of these conditions is diabetes mellitus, with roughly 15-20% of people with diabetes experiencing foot ulceration. Approximately 14-24% of foot ulcer cases require limb amputation, with only about a 50% survival rate after the amputation. Normally, a podiatrist looks for early signs of an ulcer with a machine that tests for only either temperature or pressure. Recent research has shown that the specificity of these machines is low and that multiple measurands are recommended. DuaSock is a wearable smart sock that fulfills this need by measuring two separate factors at once, temperature and pressure, while also allowing the patient to self-monitor their feet from home. This device was designed to predict the development of foot ulcers from early temperature and pressure patterns and warn the patient before the ulcer develops. An array of sensors was implemented along the bottom of the sock to take continuous measurements throughout the day. Trial runs have shown that the sock can reliably measure data in real-life scenarios and determine if an ulcer may be forming.

Team Name: DuaSock
Team Members: Dace Cole and Fatima Hussain
Sponsor: Sensoria Health
Advisor: Dr. Patrick O'Neal

3:05 IESB 224

Fall-Risk Management for Parkinson's Disease

Parkinson's disease (PD) is a progressive neurological disorder that results in detrimental gait disruptions, predisposing PD patients to harmful falls. Because people with PD have fluctuating symptoms, gait assessments made in the clinic do not always reflect the actual disease state of the patient. Our device aims to solve this problem by collecting gait data from PD patients over long time intervals in their native state and providing objective feedback. This device gathers gait data via three Sensoria® IMU sensors: one at the mid-back and one integrated into both socks. We used machine learning to train two algorithms that classify patients into a "high-risk" or "low-risk" category for falling based on gait parameters that are known to change with disease progression (step length and cadence). We also trained an individualized algorithm to differentiate between a person's normal and impaired gait. Our device will classify the patient's gait data every 10 seconds and then output the percentage of time the user entered an at-risk gait pattern. Additionally, our device reports the patient's cadence, stride time variability (STV), and bilateral coordination over time. This device calculates cadence with a percent error of 0.401% and can accurately track STV and report when it drops below the high-risk threshold of 4.4%. This device can serve as a telemedicine tool that provides physicians with objective feedback on the gait status of people with PD.

Team Name: Fall-Risk Management for PD
Team Members: Ella Beeler, Errol Mire, Natalie Roppolo, Aaron Sheppard, Madeline Zuberer
Sponsor: Sensoria Health with Maurizio Macagno
Advisor: Dr. Patrick O'Neal

BACK TO CONTENTS

BIOMEDICAL ENGINEERING

3:30 IESB 224

Bone Smith

Total joint replacements are common surgical procedures for people who have a diseased or damaged joint. Older joint implants, originally made in the 90s, often fail, and it is crucial to the patient's health that the implant is safely replaced. These older implants are held in by bone cement. Bone cement continues to harden over time, which is partially why older implants are particularly difficult to remove. To address this issue, an experiment involving the application of heat to the implant by electrical leads, outputting 44 W, was performed, which weakens the chemical bonds of the bone cement and causes the implant to separate more easily from the bone cement. To test this method, metal bolts were encased in bone cement and select samples were heated up various lengths of time to result in different final temperatures as outer bone cement temperature was a concern for cell necrosis. The force required to remove the bolts from the bone cement was compared between the heated and unheated bolts. The experiment demonstrated that there was a significant difference in the force necessary to pull the bolt out of the bone cement that was heated compared to not heated.

Team Name: BoneSmith
Team Members: Hailey Holt, Zachary Logan Morreale, Andrew Myers, Jacob Tidwell
Sponsor: John Grady, M.D. (Tech '09)
Advisor: Dr. Patrick O'Neal

3:55 IESB 224

Hydro-Coles

More than 20 million men in America suffer from erectile dysfunction. For many of these men, pills or injections can be used as a treatment for their erectile dysfunction. However, physical conditions, such as prostate cancer, can cause such methods to be ineffective. The only functional solution on the market at this time is the inflatable penile prosthesis (IPP). An IPP involves two inflatable cylinders located in the shaft, a pump in the scrotum, and a saline reservoir placed on top of the bladder. The pump is squeezed to push saline from the reservoir to the cylinders and back again.

However, this current model entails problems both for the user and the surgeon. Problems include difficulty pumping the device, causing it to take more than 30 seconds to inflate, and risk when operating near the bladder. Hydro-Coles accounts for these problems by removing the reservoir and pump and replacing them with an external motorized device. Because of this, the implant inflates in less than 25 seconds and poses less risk to the patient during surgery. In addition, this new IPP requires less time in surgery, and is easier to replace if necessary.

Team Name: Hydro-Coles
Team Members: Leann Tengowski, Devin Tooley, Parker Willmon
Sponsor: Kelly Notariano (Tech '09)
Advisor: Dr. Randal Null

BACK TO CONTENTS

4:20 IESB 224

L-Hook Manufacturing Process Optimization

The Medtronic FDA approved Laparoscopic Sealer/Divider is a surgical tool primarily used for laparoscopic procedures. The manufacturing process for the device is complex and time-consuming, as it is mostly manually assembled by operators. When defects are found during the production process, particularly after parts have been permanently welded, the materials must be scrapped. Scrapping materials results in a loss of revenue and service for patients in need. In order to reduce manufacturing process defects, the team implemented a Cognex 7000 Series Model 130 Camera to help operators properly align sub-assembly parts prior to entering the laser welder. Using the Cognex software, the system utilizes four customized decision-making tools to notify the operator if the parts are properly aligned prior to passing the part into the laser welder. During the trial run conducted at the Medtronic Boulder, Colorado manufacturing facility, data was collected for 385 devices over a 3-day period. The Cognex failure detection rate was compared to the actual production defect rate. The results indicated that if the Cognex system is implemented permanently by Medtronic, it would notify operators before laser welding, allowing them to have an opportunity to adjust the parts and decrease the total material scrap produced by approximately 30%.

Team Name: Medtronic MITG Team
Team Members: McKenna Barker, Savannah Esteve
Sponsor: Medtronic with Mr. Chris Ehr
Advisor: Dr. Patrick O'Neal

BACK TO CONTENTS

1:00 IESB 212

Economic Optimization and Hazard Analysis of a Vacuum Gas Oil Hydrocracker Process

A vacuum gas oil hydrocracker process was modeled using a number of series and parallel reactions (between 10 to 28) pathways to produce gas (Liquefied Petroleum Gas), naphtha, kerosene, and diesel. The number of real species needed to accurately simulate the respective product fractions was justified based on separator behavior. The kinetics of the reactions were justified from literature data. The system was modeled using the process simulator ChemCAD and priced using cost equations from Turton, Shaeiwitz, Bhattacharyya, and Whiting (2018). Both topological and parametric optimizations were considered. The recycle streams increased the complexity of the simulator significantly, but were required to accurately model the concentration build-up in the system. The impact of reactor residence time, temperature, separator recycle purity, and feed ratio on the economics will be presented. Process hazards will be identified and suggestions to mitigate hazards will be presented.

Team Name: All CMEN
Team Members: Hannah Lilly, Mitchell Porche, Brandon Stewart
Sponsor: N/A
Advisor: Dr. Jim Palmer

1:20 IESB 212

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Team Name: All CMEN
Team Members: Christie Johnson, Parker Reneau, Michael Voss
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

1:40 IESB 212

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Team Name: All CMEN
Team Members: Andrew Montgomery, Tally Moore, Kyle Ypya
Sponsor: N/A
Advisor: Dr. Jim Palmer

2:20 IESB 212

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Team Name: All CMEN
Team Members: Chance Donohue, Elizabeth Ezell, Pravesh Pokhrel
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

2:40 IESB 212

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Team Name: All CMEN
Team Members: De'Quinton Gie, Darrius Smith, Alex Zayed
Sponsor: N/A
Advisor: Dr. Jim Palmer

3:00 IESB 212

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Team Name: All CMEN
Team Members: Rhett Firmin
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

1:00 IESB 224

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Team Name: All CMEN
Team Members: Erin Geohegan, Adam Ramachandran, Kacie Stringer, Elizabeth Talbot
Sponsor: N/A
Advisor: Dr. Jim Palmer

1:20 IESB 224

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Team Name: All CMEN
Team Members: Sierra Matthews, Ashley Riddick, Holden Zugger
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

1:40 IESB 224

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Team Name: All CMEN
Team Members: Clayton Kerek, Austin Wills
Sponsor: N/A
Advisor: Dr. Jim Palmer

2:20 IESB 224

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Team Name: All CMEN
Team Members: Matthew Bullock, Rafael Lopez Martinez, Travis Shaw
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

2:40 IESB 224

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Team Name: All CMEN
Team Members: Zachary Call, Travis King, Tyler Libert, Jackson McCullough
Sponsor: N/A
Advisor: Dr. Jim Palmer

BACK TO CONTENTS

1:00 IESB 318

Exploring the Utility of HCl to Invert Sucrose for Succinic Acid Fermentations from Sweet Sorghum Syrups

Sweet sorghum is an attractive feedstock for the production of biochemicals and other bioproducts like succinic acid because it is a readily available source of fermentable sugars. However, its sucrose needs to be converted into glucose and fructose to maximize fermentation. The objective of this study was to investigate the inversion of sucrose in commercial sweet sorghum syrups and ferment it to succinic acid using Escherichia coli AFP184. Sucrose inversion was investigated using 0.0862 M, 0.136 M, 0.273 M, 0.409 M, and 0.545 M concentrations of HCl at 65, 75, or 85°C over the course of 240 min. It was found that using 0.409 M HCl at 75°C for 10 min was optimal to maximize sucrose inversion and prevent further sugar degradation using HPLC-RI. Rates of inversion were determined and compared to three literature formulae. Our results over approximated the rate constant by 3.23%. It was found that 27.3g/L succinic acid could be produced in 86 hours using HCl at a dose of 0.37g per 1g of sucrose in sweet sorghum syrup. Future work includes investigating the commercial scalability at the pilot plant and commercial scales using a diverse set of syrups.

Team Name: Sweet Bulldog Commodity Utilization
Team Members: Matthew Sturm
Sponsor: United States Department of Agriculture, Agricultural Research Services, Southern Regional Research Center, New Orleans, LA, with Dr. K. Thomas Klasson.
Advisor: Dr. Marsha Cole

1:15 IESB 318

Potential Thermochemical Evaluation of Human and Animal Hair Waste as a Biorenewable Fuel Source

As the demand for new alternatives to fossil fuel reserves is increasing, scientists are constantly in search of new sources that can be used to produce biochemicals and other bioproducts. Much of this research has been geared toward agricultural and food sources, but there are many creative avenues available to produce energy. One untapped source is the possible utilization of hair waste from humans and animals obtained from beauticians and veterinarians. This literature report focuses on whether hair waste has untapped energy that can be used to propel motor vehicles and satisfy the industrial demand caused by other fossil-fuel dependent commodities.

Team Name: Unbeweavable Energy
Team Members: Maya Conway
Sponsor: N/A
Advisor: Dr. Marsha Cole

BACK TO CONTENTS

1:30 IESB 318

Biochemical Evaluation of Homeopathic Remedies as Over the Counter Treatment for Vaginal Yeast Infections

A growing number of women around the world are turning to homeopathic remedies to cure vaginal yeast infections. Along with natural suppositories and yeast arrests, a new social media-driven product known as Yoni Pearls™ is becoming an online sensation. While many women are taking to social media to give testaments to the product's efficiency, very little research has been done on the usage, effectiveness, and safety of using these Yoni Pearls™ as well as other homeopathic options. In an attempt to decipher this trend, yeast arrest, Yoni Pearls, boric acid suppositories, and tea tree oil suppositories, were placed in fermentations performed on Saccharomyces cerevisiae in simulated vaginal fluid. The first major finding seen was the difference in yeast growth for each media. The yeast was inhibited more in the simulated vaginal fluid than when in only an aqueous glucose (5g/L) solution. This difference was attributed to chemical inhibitors in the simulated vaginal fluid. When the effect of the homeopathic treatments was studied in the aqueous glucose solution, significant ($P<0.5$) differences were observed in the amount of CO^2 produced. Fermentation yields were measured stoichiometrically as $CaCO^3$ by capturing the CO^2 in a $Ca(OH)^2$ saturated solution. The homeopathic treatments decreased the fermentation yields in this order: Tea tree oil suppository, Yoni Pearl™, Yeast Arrest, boric acid suppository. Further directions include determining which chemicals in the simulated vaginal fluid are inhibiting S. cerevisiae fermentation, replicating the experiments on Candida albicans, and using Bovine Serum Albumin assay to determine anti-inflammatory characteristics.

Team Name: N/A
Team Members: Sierra Napoleon
Sponsor: N/A
Advisor: Dr. Marsha Cole

1:45 IESB 318

Synergistic Evalutation of Antifungals and Anti-Inflammatory Drugs Used as Combination Therapy for Resistant Vaginal Infections

Multi drug resistant bacteria and the lack of effective antibiotics have quickly become a global crisis, specifically for women dealing with vaginitis. Vaginitis is an inflammation of the vagina that results in discharge, itching, and pain, most commonly caused by an imbalance of vaginal bacteria or yeast; hence, the most frequent vaginal infections being bacterial vaginosis and yeast infections, respectively. There have been many different strategies used to treat the disease and/or symptoms of these infections, such as outdated antimicrobial agents, homeopathic methods, and combination drug therapy. Though there are many forms of treatment, none of these help combat the multi-drug resistant vaginal bacteria that causes recurrent infections and induced inflammation. In an attempt to drastically improve the medicine prescribed for patients dealing with vaginitis, this study will investigate the synergistic properties of known anti-inflammatory drugs with known antimicrobials. By combining anti-inflammatories and existing azole antifungals, improved antimicrobial properties, synergy, and unique pharmacological profiles could possibly be produced.

Team Name: N/A
Team Members: Jalexus Richardson
Sponsor: N/A
Advisor: Dr. Marsha Cole

BACK TO CONTENTS

2:00 IESB 318

Chemical Testing of Metal-Organic Biohybrids with Biological Environments

The focus of the project revolves around Mobs, which is the acronym for metal-organic biohybrids, particularly CuHARS, a Mobs composed of copper and cystine. Because of the biodegradable nature of Mobs, there are a multitude of possible applications, including biological applications, such as drug delivery, in addition to construction and energy processes. To further research, various conditions were looked at with a chemistry focus. The first focus was stability in sodium chloride with respect to Locke's solution, a physiological solution meant to simulate an isotonic solution relative to body fluids in our body. Serial dilutions were used and as the salinity changed, the patterning of the CuHARS changed as well. Since the bonding of CuHARS are ionic in nature, the sodium chloride molarity could be cause for the change in patterning. The CuHARS display distinct movement as well depending on the solution they are put into. Future ideas for research revolve around the interactions of CuHARS with oxidizing agents such as hydrogen peroxide to see if there is any degradation and PDA, polydopamine, to see how binding to them can possibly allow for delivery across physiological environments such as the blood-brain barrier.

Team Name: N/A
Team Members: Jordan Love
Sponsor: N/A
Advisor: Dr. Mark Decoster

2:15 IESB 318

Platinum Microwire Array to Detect GABA and Glutamate Fluctuations In Vivo in Rats During Status Epilepticus

Epilepsy is a widespread disease that is characterized by recurrent seizure activity. Glutamate (GLU) and γaminobutyric acid (GABA) are, respectively, the primary excitatory and inhibitory neurotransmitters in the brain and, as such, are implicated in the genesis and spread of seizure activity in epileptic patients. An enzyme-coated platinum (Pt) microwire biosensor array was developed to continuously record GLU and GABA activity in vivo during an induced continuous seizure state known as status epilepticus (SE) in rats. The array is composed of three platinum microwires, two of which are enzyme coated. L-glutamate oxidase (GluOx) is used for GLU detection. The GluOx reacts with GLU to form H202 which is electro active and generates a current detected by the probe. For GABA detection, a second wire is coated with GluOx and GABASE, both of which produce H^2O^2. The signal from the GLU sensor is subtracted from the GABASE/GluOx-coated probe to provide the GABA signal. The sentinel wire is not enzyme coated and detects signals from interferent molecules which are subtracted from the GABA and GLU channels. Simultaneously recorded GABA and GLU signals show differences in the dynamics of GLU and GABA release for specific seizure behaviors commonly seen in SE.

Team Name: N/A
Team Members: Kayla Ponder
Sponsor: N/A
Advisor: Dr. Teresa Murray

BACK TO CONTENTS

2:30 IESB 318

One-Step Nucleic Acid Sampling Technology for Genetic Analysis

The goal of this study is to develop a solid-phase gene sampling device for efficient, quick, and non-invasive extraction of genetic material. This method involves using RNA capture pins (1cm×200µm) that have been functionalized with dT(15) oligos for selective purification of mRNA. Stainless steel needles were cleaned using ultrapure water, acetone, and hexane and then etched with sulfrochromic acid. Using the layer-by-layer technique, a triple precursor layer of polyethelenimine and poly(styrenesulfonte) was applied followed by the application of five alternating layers of oppositely charged polyacrylic acid and polyethylenimine. Amine functionalized biotin was covalently linked to the carboxyl group of the polyacrylic acid. A layer of streptavidin was applied, and the needles were incubated with 100µM solution of biotin-conjugated dT(15) oligos that selectively bind to the polyA tail of the RNA. The feasibility of the mRNA purification method was validated using a radish plant as a biological source. The RNA capture pins were inserted in the plant material for 2 minutes and transferred to the PCR reaction mixture for gene analysis. The RNA extraction step can be done in 2 minutes so this method can greatly improve the ability to perform genetic testing at a reduced cost.

Team Name: N/A
Team Members: Raye Anne Ledbetter
Sponsor: N/A
Advisor: Dr. Gergana Nestorova

2:45 IESB 318

The Effects of Heat Activation on Bacillus anthracis

Bacillus anthracis cells have the capability to transform into a more resilient type of cell called a spore when faced with starvation. This resiliency makes killing this microorganism a great struggle; this issue is of the utmost importance for B. anthracis specifically because it can be used as a biological weapon. When in the presence of the proper nutrients, the spores can switch back to the original, vegetative form in a process called germination. It has been proven that heating these spores to a temperature just below the lethal range increases the rate of germination. This effect, known as heat activation, has been proven to reverse in some Bacillus species in under three days; however, B. anthracis has not been tested.

B. anthracis Sterne spores were prepared and split into four conditions: unheated, heat activated on day one of the experiment, heat activated on the day of germination, and heat activated on both days. The germination rates were tested for these four conditions in triplicate on days 1, 7, 14, 21, and 35.

As expected, heat activation had a positive impact on spore germination. The data shows that, over a period of 35 days, there remained a significant difference between all heated and unheated samples.

Our data suggests that B. anthracis spores remain activated for at least 35 days after heating. This may have broader impacts on our understanding of heat activation.

Team Name: N/A
Team Members: Blake Roberson
Sponsor: N/A
Advisor: Dr. Rebecca Giorno-McConnell

BACK TO CONTENTS

3:00 IESB 318

Opal Synthesis

In nature, opals are formed through deposition of silicon dioxide spheres and water into natural faults, cracks, and voids. Once the water evaporates, the silica that is left behind dries out and hardens into precious opal. Although opal structures are amorphous, they have some internal order and are composed of a matrix of silica sphere particles with sizes on the visible light range of 0.4-0.8 μm. The sizes of the particles determine the gem color. Presently, opals have many scientific applications, outside of their visual worth as gems, that exploit their optical or electro-optical properties. Although synthesized opals can be purchased through many laboratories, little research is published addressing the methods one can use to synthesize them. Over the course of this research, various methods of synthesis were explored: photonic crystal synthesis, spontaneous emulsification, "at home" recipes, and different combinations of these methods. From these experiments, we were able to determine the success or failure of varying the chemical ratios of the silica source (TEOS), ethanol, ammonia, and electrolyte.

Team Name: N/A
Team Members: Destiny Hicks
Sponsor: N/A
Advisor: Dr. Sven Eklund

3:15 IESB 318

Forensic Analysis of Gun Shot Residue Using an X-Ray Fluorescence Spectrometer

On average 15,000 people are killed annually, in America, due to a gun-related homicide. To aide in investigations, crime labs need to be able to determine who recently fired a gun. After a gun has been fired a powder blows back onto that person. This powder, known as gunshot residue (GSR), contains trace elements in varying amounts such as lead, barium, antimony, and tin. An x-ray fluorescence spectrometer (XRF) is a non-destructive technique that can identify and quantify these elements at the part-per-million level. By matching the ratio of the elements in GSR samples, the XRF spectrum can be used as a forensic fingerprint for the type of gun and ammunition. To test whether XRF can be used to identify GSR on a suspect, a cotton swab soaked with isopropyl alcohol was used to wipe across the hand of a person who just finished firing a gun. The cotton swabs were stored in plastic bags and later loaded into the XRF instrument. A calibration curve was used to identify the concentration and ratios present in the samples. These ratios were then correlated to determine whether the identification of gun type, gun caliber, or the ammunition brand were possible.

Team Name: N/A
Team Members: Kennedy Freese
Sponsor: N/A
Advisor: Dr. Sevn Eklund

BACK TO CONTENTS

3:30 IESB 318

Separation and Identification of JUUL Pod Components

Various separation techniques were utilized to isolate the different components of JUUL pod e-liquid. One important component is the amount of nicotine. Since nicotine is a minor component, several techniques have been used to separate it from the propylene glycol and vegetable glycerin and quantify it. The nicotine was obtained by either solvent extraction or thin layer chromatography (TLC) followed by analysis with ATR-FTIR, Raman Spectroscopy, and UV-Vis spectrophotometry. Other techniques used combined separation and quantification: high-performance liquid chromatography with UV detection and gas chromatography with an FID detector. The results show that nicotine can be extracted and quantified from the e-cigarette liquid. However, some results proved to be inconclusive as the technique was unable to provide sufficient data.

Team Name: N/A
Team Members: Brianna Hood
Sponsor: N/A
Advisor: Dr. Sven Eklund

3:45 IESB 318

Solid Phase Peptide Synthesis Using the Rink Amide Resin

Solid phase peptide synthesis proves to be a useful procedure in the synthesis of polypeptide chains, which would be difficult to express in plasmids. Expression of these proteins can be used for a variety of research practices, such as testing the affinity of different sequences in relation to certain microbial spores or viruses. The solid phase resin that was used in the protocol is the rink amide resin. This resin acts as an anchor during the addition of each peptide bond and is cleaved from the protein once the target sequence has been fully synthesized. The addition of each bond is possible by deprotection of the amine group of each amino acid using a strong base, followed by the addition of a prepared coupling solution. The general outline of the practical mechanism of this rink amide polypeptide synthesis is as follows: 1) Attachment of initial N^γprotected amino acid to rink amide resin, 2) Deprotecting N^γof attached amino acid, 3) Activation and coupling of following amino acids, and finally 4) Cleaving polypeptide from resin.

Team Name: N/A
Team Members: Cameron Murphy
Sponsor: N/A
Advisor: Dr. Scott Poh

BACK TO CONTENTS

4:00 IESB 318

Solid-Phase Peptide Synthesis of Cell-Penetrating Peptides to Target Sites of Inflammation

Current therapeutic agents on the market lack specificity and struggle to penetrate a cell's natural barrier. To limit the side-effects of these therapeutic agents, there is a growing need to discover agents that are selective and specific for biomedical applications. The use of cell-penetrating peptides (CPPs) has increased in recent decades due to their ability to cross these natural barriers and target specific cells. This study used solid-phase synthesis to synthesize two CPPs: Penetrin and Octaarginine. Solid-phase peptide synthesis was performed using Rink Amide resin and Fmoc protected amino acids. From prior CPP studies, the most efficient chemical washing reagents, deprotecting reagent, and cleaving reagents were used. The CPPs synthesized are then evaluated for yield and efficiency.

Team Name: N/A
Team Members: Jennifer T. Nguyen
Sponsor: N/A
Advisor: Dr. Scott Poh

4:15 IESB 318

Liquid Crystals

Our research goals focus on the design and synthesis of functionalized polymeric materials. In this research, our aim is to prepare 4,4′–bis(silyloxanyl) alkyloxy)azobenzenes incorporated into a polymer that forms photo–reversible calamitic liquid crystalline networks. Such polymers may have advanced technological use as stimuli-responsive, shape-memory materials. To–date, we have been exploring efficient methods of synthesizing the 4,4′–bis(hydroxyl)–azobenzene core structure en route to this target elastomeric polymer network.

Team Name: N/A
Team Members: Reeki Patel
Sponsor: N/A
Advisor: Dr. Philip J. McMullan

4:30 IESB 318

Using DFT Calculations to Understand the Difference in NMR J-Coupling Constants of Sn Complexes

NMR J-couplings can be a useful tool for chemists to determine unknown structures because of the relationship between J-coupling and bonding. The NMR J-couplings of two tin complexes, [SnH3]- ¬and [SnH3]+, have been studied extensively. [SnH3]- has a pyramidal geometry due to the lone pair on the tin. [SnH3]+ has a planar geometry. In this project, we looked at J(1H, 119Sn). The J-coupling of the two tin complexes is vastly different. We used first principles density functional theory (DFT) calculations to view the NMR spectra and the molecular orbital diagrams of 4 tin complexes. The complexes we analyzed were the two standard geometries of the tin complexes, then we forced the [SnH3]- to a planar geometry and [SnH3]+ to a pyramidal geometry. Using perturbation theory, we analyzed the coupling constants and now have an understanding of the relationship between the molecular orbitals and the change in the coupling constants of the two tin complexes.

Team Name: N/A
Team Members: Patrick Landry
Sponsor: N/A
Advisor: Dr. Kristopher Harris

BACK TO CONTENTS

4:45 IESB 318

Effect of Atmospheric Conditions on the Luminescent Properties of Lanthanide Compounds

As light emitting-diodes (LEDs) become more popular for general lighting applications, there is a need for LEDs with high color rendering. As either electroluminescent materials or phosphors, lanthanides can be used to afford color tunable LEDs. This is because lanthanides have high Stokes shifts and sharp emission spectra. High color rendering can be achieved through the development of trichromatic systems. For a trichromatic red-green-blue (RGB) based LED, the complex can contain two lanthanides including Eu3+ as the red emitter, Tb3+ as the green emitter and an organic ligand as the blue emitter. Our group has used lanthanide beta-diketonate ligands to obtain lanthanide complexes with varying color emissions. Based on current work in our group, it has been found that lanthanide beta-diketonate complexes have luminescence characteristics that can also change with reaction conditions. The effect of moisture on these lanthanide beta-diketonate complexes continues to be investigated using mechanochemical synthesis of both hydrated and anhydrous lanthanide starting materials in both air and nitrogen atmosphere. The physical and spectroscopic properties of these complexes was analyzed using DSC, FTIR, UV-Vis, and fluorimetry to determine how ambient moisture affects color rendering in lanthanide-based LEDs.

Team Name: N/A
Team Members: Andrew A. Brown
Sponsor: N/A
Advisor: Dr. Elisabeth Fatila

5:00 IESB 318

Synthesis and Characterization of Redox Tunable Cerium Complexes Containing Beta-Diketonate Ligands

Cerium is unique amongst the lanthanides for having two accessible oxidation states: +3 and +4. The ability of cerium to act as a Lewis acid and undergo redox reactions has made it attractive as a catalyst for organic reactions. The oxidation state of cerium can be tuned through coordination of electron donating or withdrawing ligands. Electron withdrawing ligands stabilize the trivalent oxidation state, whereas ligands with electron donating groups stabilize the tetravalent state especially ligands bearing bidentate oxygen donors. In order to study the effects of redox tuning, the beta-diketonate ligand provides the same donor atoms and allows for fine adjustments of the electronic and steric properties of the ligand. Several beta-diketonate cerium complexes of the form Ce(beta-diketonate)3 hydrate or Ce(beta-diketonate)4 were prepared and analyzed by 1H and 13C NMR (nuclear magnetic resonance), IR (infrared spectroscopy), and UV-Vis spectroscopy. We synthesized all Ce complexes in solution and mechanochemically to compare the results using the aforementioned techniques. The results obtained from this study will be used to design structurally related redox active bidentate oxygen donor ligands.

Team Name: N/A
Team Members: Layne Dishman
Sponsor: N/A
Advisor: Dr. Elisabeth Fatila

BACK TO CONTENTS

CIVIL ENGINEERING

1:00 IESB 124

Tech Project

Following the tornado that hit Louisiana Tech's Ruston campus in April of 2019, work needed/needs to be done to restore the campus and move forward. Our project is a part of this recovery. For this project, we were tasked with: designing a more efficient method for pedestrians to cross LA HWY 544, also known as Tech Drive, design a retaining wall for the new baseball stadium which is currently under construction, design a new parking lot for the baseball stadium, and design a new parking lot for the dormitories which will be built on the corner of Railroad Avenue and Tech Drive.

Team Name: The Bulldog Builders
Team Members: Jacob Beulah-Walton, Jarrett Elliott, Owen Hart, Alexandra Leblanc
Sponsor: Monroe District, Louisiana Department of Transportation and Development, with Mr. Thomas Marshall Hill, P.E., P.L.S
Advisor: Dr. Nazimuddin Wasiuddin

1:25 IESB 124

Cheniere Lake Bridge Drawdown Structure

The Cheniere Lake bridge is a concrete slab bridge with timber spans in West Monroe, Louisiana. The structure needs to be demolished as it has received a bridge inspection rating of poor in 2016. In place of the bridge, an earthen levee will be constructed with a roadway on top. Parameters include designing a draw-down structure to lower the lake level by four inches per day and keeping back-flow from entering the lake through the Ouachita River. Analysis of the geo technical report, soil borings, existing levee, and watershed area are performed for the design. The team is partnered with Construction Engineering Technology students to create a cost estimate and sequence of construction.

Team Name: Group 2
Team Members: Micaela Clouse, Anna Katya Opel, Lannie Skelly, and Casey Staller
Sponsor: Monroe District, Louisiana Department of Transportation and Development, with Mr. Thomas Marshall Hill, P.E., P.L.S
Advisor: Dr. Eric Borquist

1:50 IESB 124

Bridge Replacement on LA 507

The LA 507 bridge is a 2-span, 120-foot long bridge near Bienville, Louisiana. This bridge needs to be replaced due to age and deterioration, and the constant use by fully loaded trucks transporting resources. The goal of the project is to design a bridge using a 25-year return period in place of the current design. The scope of this project includes the bridge and its approach, pavement structure, drainage design, right-of-way needs, temporary detour roadway layout/design and traffic control, and construction sequence. Redesigning this bridge will allow for safer passage to and from Bienville and for the heavy traffic of trucks transporting around the area.

Team Name: Team 3
Team Members: Cole Albritton, Brandon Ashlock, Brian Cespiva, Jack Godbery
Sponsor: Louisiana Department of Transportation and Development – District 04 with Robert C. Tomasek, P.E
Advisor: Dr. Shawn Sun

BACK TO CONTENTS

CIVIL ENGINEERING

2:15 IESB 124

Pierremont Park Gravity Sewer Improvements

We, Team 4, were tasked with the design of a new 30" aerial crossing spanning the width of Bayou Pierre. The main objective of this project is to construct a new support system to carry a larger pipe load while avoiding obstruction to the flow of Bayou Pierre. The existing design consists of two intermediate pier supports that currently obstruct the flow of water by collecting debris at its base, resulting in build-up and increased flood elevation in that area. Along with our objective, our major design constraint would be to design this support system in a way that would not raise the 100-yr water surface elevation by more than one-tenth of a foot (1.2 inches).

Team Name: Team 4
Team Members: Tanner Borskey, Johne Brooks, James Malone, Joshua Reed
Sponsor: Civil Design Group, LLC,. with Mr. Mitch Guy, P.E
Advisor: Dr. Shaurav Alam

2:40 IESB 124

Box Culvert Replacement-Ockley Ditch at Ratcliff

This project documents the design and calculations for the Box Culvert Replacement project assigned in September of 2019. The project requires our team to redesign an existing canal and bridge located in Shreveport, Louisiana, with a budget of $500,000 set for the construction of the bridge portion. Parameters of the project require our team to develop a design which includes: hydraulic analysis, design of storm water canal system, structural retaining walls, concrete lining, structural design of the bridge, and a geotechnical analysis of underlying soils surrounding the bridge. Our main goals are to provide a sufficient canal design to eliminate flooding in surrounding areas, provide a safe and effective bridge design, and present a cost-efficient solution for the project.

Team Name: Group 5
Team Members: Brady Ewing, Christopher London, Bennett Lowery, Matthew Mire
Sponsor: Caddo Levee District, City of Shreveport, with Mr. Ali Mustapha, P.E.
Advisor: Mr. Reginald Jeter

BACK TO CONTENTS

CIVIL ENGINEERING

3:05 IESB 124

Twin City Distributors: Warehouse and Office Building

Aillet Fenner Jolly McClelland, Inc. is requesting the design of a warehouse and office/training building in Shreveport, Louisiana. This project will entail both structural and civil design work. The warehouse is to be 180 x 100 ft with a sixty-ton overhead crane. It is expected to have ten overhead doors along one of the 180 ft .sides with a loading ramp in front of each, therefore, requiring the implementation of retaining walls. The warehouse will also contain a control room with a mezzanine above for heavy storage. The office space is expected to be a two-story 80 x 75 ft. building. The 80 ft. side of the office space will be directly adjacent to the 100 ft. wall of the warehouse, and both buildings will have mono-slope roofs. The group must also design a sufficient parking lot for the inflow and outflow of traffic into the office space as well as a driveway capable of withstanding heavy truck traffic. Drainage design for the project is then needed to ensure that the new buildings and roadways will not produce any new runoff into the surrounding properties. This includes designs for underground structures and/or detention areas that will hold rain.

Team Name: GS(M^2) Consulting
Team Members: Matthew Barbier, Gabriel Clottey, Sydney Thibodeaux, Mark Veasey
Sponsor: Aillet Fenner Jolly McClelland, Inc. with Mr. Daniel Thompson
Advisor: Dr. Jay Wang and Dr. Shawn Sun

3:30 IESB 124

East Hardy

The East Hardy Street Bridge is a steel truss bridge that spans 500 feet across the Leaf River between Hattiesburg and Petal, Mississippi. The scope of this project is the structural design for the replacement bridge. The design includes the bridge superstructure, piers, and pile foundations. Additionally, the bottom chord of the bridge must be above the 100-year flood elevation, and construction in the river channel is to be avoided because of an environmental constraint given by Forrest County, Mississippi. The roadway cross-section has been provided by the transportation team and is to be a two-lane road with dedicated bicycle lanes and pedestrian walkways. The design process follows the AASHTO LRFD Bridge Design Specifications, MS Standard Specifications, and MDOT Bridge Design Manual.

Team Name: Group 7
Team Members: Wade Burton, Chenjun Lu, Benjamin Robins
Sponsor: Civil and Stuctural Engineer, Inc. with Mr. Mike Smith, P.E.
Advisor: Dr. Shawn Sun

BACK TO CONTENTS

COMPUTER SCIENCE

1:00 IESB 216

Project Meal Planner

Project Meal Planner is a web-based app to manage the ordering of groceries based on meal planning and caloric goals. The project solves the problem in multiple stages. Stage 1 involves the user specifying their desired caloric intake for the week as well as any allergies the user may have. In Stage 2, the system will search a list of recipes that can be assembled according to the user inputs. The user can then select their preferred plan and make modifications if needed.

Team Name: Abraca-Data
Team Members: Darrell Durousseaux, Clay Fonseca, Coleman Levy, Kyle Morales, Brad Raynaud
Sponsor: N/A
Advisor: Dr. Mike O'Neal

1:30 IESB 216

Lunchpad

Lunchpad is a Collaborative Dining Decision Platform. The goal of the project is to create a website for two or more people to choose a place to eat without having the hassle of trying to pick a place that everyone enjoys. This will be accomplished by allowing users to join a room using created codes on the website and enter their preferences for eating. Next, an algorithm will determine which types of food should be pulled by Google's API based on what they enjoy or do not enjoy. Finally, a random decision algorithm will decide one place and suggest it to the users. Additional features include: a food allergy toggle, location on where to eat, and a reroll feature that chooses another place to eat.

Team Name: Box Crewe
Team Members: Kimberly Atienza, Bradford B Doughty, Wei Xing (Stella) Li, Jacob C Sennett, Caleb M Snook, John T Wolz
Sponsor: N/A
Advisor: Dr. Mike O'Neal

2:00 IESB 216

Perfect Photo App

Taking good group photos is difficult, and this app seeks to remedy that. When taking a group photo, this app allows the user to simply set up their camera and let the app take the photo when it's ideal. Through facial detection technology, this app takes a photo when everyone is smiling and has their eyes open. The app gives feedback to the user, showing the user detected faces, smiles, and eyes, and letting the user know when a photo is taken, to make the app as intuitive as possible.

Team Name: Nick of Time
Team Members: Zach Cloutet, Samuel Ehlmann, Bibhut Khadka, Nirjala Parajuli
Sponsor: N/A
Advisor: Dr. Mike O'Neal

BACK TO CONTENTS

COMPUTER SCIENCE

2:30 IESB 216

MITTY [Math Input To Text (for) You]

This project is a math-to-text formatting web application. At Louisiana Tech University, students enrolled in Calculus classes do their homework on a website called Webwork. Webwork requires that all answers be entered in a plain-text format, which can be very challenging when entering equations (for example, fourth degree Taylor polynomials). Math Input To Text (for) You, or MITTY, is a user-friendly website capable of taking images (e.g. camera, clipboard, file system, and snipping tool) of equations as well as handwritten input and converting it to plaintext. Since the result is returned as plaintext, the output of MITTY can also be used on other online homework websites.

Team Name: Null Pointer Exception
Team Members: Ankit Aryal, Lindsay Cason, Yinghao Lin, Owen Sutka, Eboni Williams
Sponsor: N/A
Advisor: Dr. Mike O'Neal and Dr. David Meng

3:30 IESB 216

AttendME

AttendME is an automatic class attendance check-in webpage. There are various ways to take attendance, all with their own drawbacks. This idea seeks to minimize the amount of time required for a professor to take attendance in class. The webpage allows students to check in to classes via geolocation on a roll uploaded by the professor. This roll can specify classroom location and time of class in order to create parameters for check-in. This requires the student to be in attendance and for everything to be done automatically, easing the process while also making it more reliable. Core features will include:

- The ability of the student to check in using time and geolocation,
- The ability of the professor to upload class roll, location, and time,
- The option for students to check in automatically by uploading their class schedule or manually check in,
- The ability of the professor to manually check in students not using the app, and
- The ability of the professor to export the attendance records to Excel (via CVS format).

Team Name: Spring Engineering & Electronic Dudes
Team Members: Hunter Allen, Noah Broussard, David Doan, Michael McCrary, Ross Piraino
Sponsor: N/A
Advisor: Dr. Jonathan Walters

BACK TO CONTENTS

4:00 IESB 216

Stargazer

The goal of the project is to design a fully functional web app to be used by astronomers and stargazing hobbyists. The web app will feature a live feed of the night sky above Louisiana Tech, an image library of special events (e.g. shooting stars), a user rating system, and weather updates for Ruston, Louisiana. To achieve these features, an HD fisheye camera will be used to capture images and present a live feed; TensorFlow and a light sensor will be used to create and train a neural network to capture abnormal events. SQL will be used to manage databases that store images and user information; the DarkSky API will be used to pull weather data, and Flask (written in Python) will be used to build the web framework while using languages such as Jinja2, HTML 5, CSS 3, and JavaScript to build and design the website.

Team Name: Untitled Group
Team Members: John Chung, Ammar Essajee, Alexander Faucheux, Jonah Landry, Jason Myles
Sponsor: N/A
Advisor: Dr. Mike O'Neal and Dr. John Shaw

4:30 IESB 216

Teaching Cyber Security Through a Game

In a society that is as intertwined with technology as ours is, it is important that everyone has at least a basic understanding of cyber security and how to be safe online. The goal of this project is to teach the basic concepts of cyber security to kids through a game, so that they may be better prepared to navigate through the digital world. This game, which consists of a platformer and a series of mini-games, aims to teach concepts such as secure password creation, personally identifiable information, and secure communication. By playing this game, kids should learn about these concepts, along with others, and have a better understanding of how the internet at large operates.

Team Name: Cybernaughts
Team Members: Zachary Brasseaux, Robert Brown, Rebecca Grantham, Emily Rumfola, Chaoqun Yu
Sponsor: N/A
Advisor: Dr. Kevin Cherry

BACK TO CONTENTS

COMPUTER SCIENCE

1:00 IESB 218

Mowr - Automated Lawn Care Systems

Today's technology has made the everyday lives of millions of people much easier through "smart" devices and automation. Tasks like vacuuming, turning on/off lights, locking doors, and other household nuances can be completed by technology and are no longer a part of the daily struggle. The purpose of this project is to make the average person's daily life even easier by eliminating another well-known dreaded task: mowing the lawn. Mowing grass can be an extremely strenuous task that can take hours of valuable time and is especially difficult during extreme hot or cold weather. Additionally, some people are not capable of mowing their own grass because of physical limitations or don't have the time, and may not be able to regularly pay a service to do it for them. Even those who are capable of mowing their own grass simply may not want to deal with this never-ending chore. Creating a system that will automatically complete this task of mowing the lawn will help everyone from the disabled and elderly people who cannot maintain their lawns themselves to those who really just don't want to cut the grass.

Team Name: Team Lawn Mower
Team Members: Marcus Castille, Jordan Edgel, Matthew Greene, Joshua Mendoza, Anna Weeks
Sponsor: N/A
Advisor: Dr. Kevin Cherry

1:30 IESB 218

csWherever

csWherever is a foundation for an online learning environment for computer science concepts using Java, similar to the AP-CS course requirements. It will include a web-based GUI that includes space for students to code, an output window, and a window that will visualize what the variables and data structures are doing from the code. It will also collect a variety of user actions (e.g., mouse events, keyboard actions) to store in a database, which will later be used to provide feedback to the learner. If time allows, this framework will be further developed to provide lessons and coding practice for high school students and to analyze the data collected as feedback for the learner.

Team Name: J.J.A.Z.C.
Team Members: Justin Garrett, Assiya Kalykova, Jihye Park, Zackary Phillips, Christian Thibodeaux
Sponsor: N/A
Advisor: Dr. Loraine Jacques

BACK TO CONTENTS

2:00 IESB 218

Spotify Song Integration in Games

Today, game developers have three main options when choosing music for their games. They can choose to make an original soundtrack; they can pay artists directly for their music, or they can use free non-copyrighted music in their games. These options are either very expensive or entirely unsatisfying. In our project, we are giving game developers another option to consider when adding music to their games. Our project aims to connect the Spotify API with video games so that developers can use any music available on Spotify within their games. Games with this integration require that the players have a premium Spotify account and be logged in. When implemented properly, game developers can use Spotify's extensive library of songs to create dynamic soundtracks that can change based on in-game events.

Team Name: Int Elligence;
Team Members: Atmesh Acharya, Cody Holland, Ethan Sanford, Breno,Yamada Riquieri
Sponsor: N/A
Advisor: Dr. Kevin Cherry

2:30 IESB 218

Employee Location Tracking System

The purpose of our system is to track by GPS the employees of a company for accountability and safety. The application will be run on either iOS or Android phones. When the user logs in, the app will begin tracking the user's location as they go to potential worksites and other errands. The application has the capability to turn off the tracking when the user goes on break and can be set to automatically stop tracking when the user clocks out. The data is sent to a secure database that can be monitored by an admin via a website. The website supports features to filter the data as well as the capability to create and edit users.

Team Name: Watchmen
Team Members: Andre Caver, Tyler Nelson, Peyton Sidders, Holland Wolf, Wenfeng Zhu
Sponsor: N/A
Advisor: Dr. Kevin Cherry

3:30 IESB 218

LATech Lost & Found

Our goal is to create a cross-platform mobile application (iOS and Android) that students at Louisiana Tech can use to submit reports of lost or found items to a database running on AWS. Additionally, the app will provide admin functionality such as viewing item reports and alerting users that an item of theirs has been found. Any user will be able to submit reports, while admins will need to securely log in to the app via a PIN.

Team Name: Patent Pending
Team Members: Christopher Damare, Nicholas Jones, Seth Martin, Kaleb Rhody, Daniel Valcho
Sponsor: N/A
Advisor: Dr. Kevin Cherry

BACK TO CONTENTS

4:00 IESB 218

FlexLazer

Smart boards are expensive and not very common in the classroom. Our project will allow any projector / screen to become a smart board. By using the presenter's own laptop camera, our project will track any laser pointer shined at the screen and dynamically draw lines over the displayed content. This allows the presenter to highlight text, circle important terminology, and otherwise annotate their displayed content by simply shining a laser pointer at the screen allowing our application to detect the laser pointer, drawing where the laser pointer goes. Our software can then clear out or save any annotations made. Our software aims to be a cross platform and adapt to various types of laser pointers.

Team Name: FlexLaserz
Team Members: Taylor Antley, Ryan Brown, Juan Chavez, Marcus Garner, Richard LeBell
Sponsor: N/A
Advisor: Dr. Kevin Cherry

4:30 IESB 218

uBETcha College Football User-Variable Model

The goal of this project was to create a statistical model for predicting the outcome of college-level American football games. The software used to create this project includes React, NodeJS, ExpressJS, and mySQL. We made a website that has access to a database containing the data that creates our statistical model. The website also has three levels of users, with each user having a personal interface. Depending on the user's level, they will have access to different actions and information. All users have access to a model displaying the odds of one team winning over another. With a higher level, a user will be allowed to alter certain factors for the model which could give a different statistical outcome to lower level users. This feature of allowing the end-user to modify factors within the model is not available in many models besides ours. Our model uses logistic regression, a method used in statistics to estimate the probability of an event occurring based on previous data, to predict the outcome of future games within the NCAA. Our model was inspired by a model created by Stephen Bouzianis of University of New Hampshire, Durham. His paper, "Predicting the Outcome of NFL Games Using Logistic Regression" details the model he invented.

Team Name: Team NULL
Team Members: Andrew Almond, Lane Arnold, Zachery Bignall, Travis Freese, Matthew Tures
Sponsor: N/A
Advisor: Dr. Benjamin Drozdenko

BACK TO CONTENTS

CONSTRUCTION ENGINEERING TECHNOLOGY

1:00 IESB 220

I-12 Bridge Project

In St. Tammany Parish, there is a section of I-12 that needs to be demolished and widened. Our group will create an estimate for the widening of the bridges between US 190 and LA 59 with a schedule of the estimated construction duration. We will be using Primavera P6 to create the schedule and HeavyBid to create the estimate. The main priority of the project is to accomplish the project in the safest manner possible, for both civilians and our labor force, as well as make it cost effective. It is up to our group to create the necessary documents and prepare a presentation for this project.

Team Name: The Boys
Team Members: Joseph Benedict, Brandon Morrow, Joseph Orgeron, Devin Rowland, Douglas Su
Sponsor: James Construction Group with Mr. Chet Chautin
Advisor: Mr. Reginald Jeter

1:30 IESB 220

I-12: US 190 to LA 59 Bridges

Bamburg Builders is working as an independent cost estimator for the Interstate 12: US 190 To LA 59 Project in St. Tammany Parish. The objective of this task is to widen three bridges 1) over the intersection of I-12 and US 190, 2) over the Ponchitolawa Creek, and 3) over the canal and bike path. The project will begin at Log Mile 9.970 and end at Log Mile 12.993. We will be handling the bid work for demolition, construction, and close out of the bridge widening for the project. The types of construction for the entire project consists of earthwork, asphalt concrete, class II base course, bridge widening with AASHTO girders, column bent and pile bent, and concrete median barriers. We have previous experience with software such as Primavera P6 and HeavyBid. These applications will be used throughout the duration of the project. Primavera P6 will be used for scheduling purposes, and HeavyBid will be used for estimating purposes.

Team Name: Bamburg Builders
Team Members: Nicholas Ayers, Mason Bamburg, Blaine Johnson, Chloe Wallace, Matthew Wilkins
Sponsor: James Construction Group with Mr. Chet Chautin
Advisor: Mr. Reginald Jeter

2:00 IESB 220

State Project NO.H.011152 I-12: US 190 - LA 59

For this project, our team is to act as an independent cost estimator for the bridge widening construction on State Project NO.H.011152 I-12: US 190 - LA 59. The project consists of a total of 6 bridges with 3 eastbound and the other 3 westbound. Each of these bridges will be widened on the inside and the outside of Interstate 12. As a team, we are to produce an independent cost estimate and schedule for the widening of these bridges. We have the full plans available for our use.

Team Name: Rock Solid Construction
Team Members: Dominic Brown, Travis Fontenot, Hunter Golden, Dillon Hostetler, Lance Sanders
Sponsor: James Construction Group with Mr. Chet Chautin
Advisor: Mr. Reginald Jeter

BACK TO CONTENTS

CONSTRUCTION ENGINEERING TECHNOLOGY

2:30 IESB 220

State Project NO. H.011152 I-12 Bridge Widening

To accommodate the high traffic of I-12 between Baton Rouge and Slidell, DiVincenti and Sons was contracted to widen the bridges between US 190 and LA 59. The bridges to be widened are located at US 190, the Ponchitolawa Creek bridge, and the Tammany Trace bike trail. Due to high traffic volume, the bridges will be widened concurrently. In some instances, the work will be at night, especially when setting the bridge girders, in order to comply with the US Highway Regulations.

Team Name: DiVincenti and Sons
Team Members: Kyle Conrad, Brice Divincenti, Jacob Felch, Alex Houeye, Caleb Pierce
Sponsor: James Construction Group with Mr. Chet Chautin
Advisor: Mr. Reginald Jeter

3:00 IESB 220

I-12 Project

JJACS Construction has been tasked with the widening of 3 eastbound and 3 westbound bridges on Interstate 12. The bridge widening is a portion of a complete widening project on Interstate 12 between US 190 and LA 59 in St. Tammany Parish. We will be forming a bid estimate along with a project schedule. The estimate will be completed using HCSS Heavybid and the project will be scheduled using Primavera P6.

Team Name: JJACS Construction
Team Members: Joseph Allen, John Berry, Andrew Holson, Stephen Kessler, Caleb Witt
Sponsor: James Construction Group with Mr. Chet Chautin
Advisor: Mr. Reginald Jeter

1:00 IESB 222

Reconstruction of the Chalmette Slip Wharf A

For our capstone project, we are acting as an independent cost estimator to the owner for the reconstruction of Wharf A at the Chalmette Slip in Arabi, Louisiana. We will be providing a detailed estimate and a CPM schedule for the construction of the wharf. We will be preparing our estimate with the use of HCSS HeavyBid, and it will include materials, labor, equipment, trucking, indirects, contingencies, etc. For the CPM schedule, we plan to use Primavera P6. Our references include the Rehabilitation of the Chalmette Slip Plans (for Wharfs F & A, at 60% of the design stage), Louisiana Standard Specifications for Roads and Bridges (LSSRB) 2016, and RS Means.

Team Name: Nailed It Construction
Team Members: Colby Holmes, Lucas Mathis, Ty Mullens, Grant Pryor, Alejandro Villarreal
Sponsor: Boh Bros Construction Company, LLC. with Mr. Jeff Plauche
Advisor: Mr. Reginald Jeter

BACK TO CONTENTS

CONSTRUCTION ENGINEERING TECHNOLOGY

1:30 IESB 222

Wharf A

The purpose of our capstone project is to assemble a bid estimate for the Reconstruction of Wharf A at the Chalmette Port in Arabi, Louisiana. We will present our estimate and schedule to a panel at the end of the quarter. We will be putting together a bid estimate complete with unit pricing, a list of materials, an equipment schedule, and a detailed construction schedule. The pricing will also include each line item necessary for this project. We will be using Primavera P6 to make the schedule and HeavyBid to create the estimate.

Team Name: Taco Corp
Team Members: Hector Aguirre, Cameron Hadley, Morgan Hall, Alex Roberts, Michael Woods
Sponsor: Boh Bros Construction Company, LLC. with Mr. Jeff Plauche
Advisor: Mr. Reginald Jeter

2:00 IESB 222

Chalmette Wharf A

We will be acting as an independent cost estimator to provide the owner an estimated cost for the reconstruction of Wharf A at the Chalmette Slip in Arabi, Louisiana. We will do a detailed estimate that includes all materials, labor, equipment, freight, indirects, contingencies, etc. The detailed estimate must be done using HCSS Heavybid. We must also include a complete estimate sheet with all unit prices, extended prices, and total project cost. A CPM schedule for the construction of Wharf A will be provided and it will be done using Primavera P6. The bid items to be included are mobilization, permanent sheeting, treated piles, steel piles, concrete, girders, reinforcing steel, elastomeric bearing pads, unsealed expansion joints, lightweight aggregate, and 48″ U-Beam.

Team Name: Cap(stone) and Gown
Team Members: Michael Knowles, Karli Loftin, Austin Pace, Janet Randle, Riley Smith
Sponsor: Boh Bros Construction Company, LLC. with Mr. Jeff Plauche
Advisor: Mr. Reginald Jeter

2:30 IESB 222

Reconstruction of Chalmette Wharf A in Arabi, Louisiana

The reconstruction of Chalmette Wharf A is a marine construction project to replace the existing Wharf A. The scope of work includes driving timber and steel piles, setting precast concrete girders, placing a concrete deck, and installing a fender system. We will be estimating the labor, equipment, and all materials needed. Additionally, we will be determining the best construction methods and scheduling all operations to complete the project.

Team Name: The A-Team
Team Members: Matthew Allen, Jacob Y. Finley, Bryan Grigsby, Miles Maheu, Mark Russell
Sponsor: Boh Bros Construction Company, LLC. with Mr. Jeff Plauche
Advisor: Mr. Reginald Jeter

BACK TO CONTENTS

CONSTRUCTION ENGINEERING TECHNOLOGY

3:00 IESB 222

Cheniere Lake Bridge and Drawdown Structure

We are tasked with the removal of an existing spillway and bridge for Cheniere Lake, building a levee with culverts running through it and a road on top. The building of a new levee and water control structure is due to the terrible integrity of the bridge and spillway. Design was provided by the Civil Engineering Senior Design team. For our project, we will use Primavera P6 to plan out the work schedule and establish our critical path to determine the early and late finishes for each stage of our project. We will be using HeavyBid which allows us to calculate all material and labor costs and create a bid to submit.

Team Name: Capstone Critters
Team Members: James Gray, Joseph Hart, Jebadiah Kraft, John Romig
Sponsor: D & J Construction Company, LLC. with Mr. Ryan Laborde
Advisor: Mr. Reginald Jeter

BACK TO CONTENTS

2:00 IESB 226

Secure Wireless Apparatus Network System (SWANS)

Secure Wireless Apparatus Network System (SWANS) is a device that, by using a microcontroller, monitors the temperature and flow rate of water or a given chemical and then sends the obtained information securely through the network to a mobile application, developed by the team. This information allows an authorized user to monitor the properties of chemicals and locations on his or her tablet. On the app, the user can see in real time whether the properties of the chemical are within the user-defined parameters, close to surpassing the parameters, or out of the parameters. SWANS is run using elliptic curve cryptography (ECC).

Team Name: The Bevy of SWANS
Team Members: Paul De Soler, Alexandra Duran Chicas, , Zachary Guillot, Andrew Theodos, Haley Wichman
Sponsor: N/A
Advisor: Dr. Miguel Gates

2:30 IESB 226

EZ Vote Secure

Voting is essential to American democracy. For proper functionality, it is imperative that as many eligible citizens as possible register and participate in our country's elections and that every vote is counted without bias. These fundamental requirements should be considered when making design decisions for a voting system. For this project, our team has worked to create a voting system that satisfies these fundamental requirements with enhanced security and reliability without compromising the user experience. The goal is to achieve a more trustworthy voting system that has a positive effect on voter participation.

To achieve our project goals, our team considered various design alternatives. The main departure of our voting system from the current system is our inclusion of a blockchain network for verifying and storing votes. The blockchain network provides an extra layer of security for vote integrity by requiring a distributed consensus for each vote and making the storage of votes immutable. Thus, an attacker would have to compromise over half of the nodes on the network to take control of the system. The blockchain network also does not require trust to be placed on one party, improving trust in vote integrity, fairness, and accuracy.

Team Name: The Blockchain Gang
Team Members: Joseph Bingham, Austin Blanchard, Rylan Burlison, Matthew Reed, Collin Sanford
Sponsor: N/A
Advisor: Mr. Sangam Mulmi

BACK TO CONTENTS

3:00 IESB 226

ProtoNet

As computer networks continue to evolve and expand their reach into our lives, so too have the threats of intrusion, infection, and data breaches. The prevalence of malware continues to put livelihoods and even personal identities at risk, and ransomware costs millions in damage each year. Now more than ever, the importance of security on all levels should be emphasized, especially the network layer. ProtoNet is a tool that aims to make network design more secure on a foundation level by generating secure network layouts. ProtoNet offers an informative and user-friendly solution for building a network. While the program highlights the benefits of a secure network foundation and offers guidance in this area, the network configurations are fully customizable, allowing the user to edit generated layouts and enter what network resources they want included. As a tool that facilitates this process, ProtoNet helps to encourage secure network practices and protects the user's data.

Team Name: Connection Crew
Team Members: Alicia Centers, Kerri Gustinger, Brendon Mayhall, Merrik Watson, Kenton Wilhelm
Sponsor: N/A
Advisor: Dr. Miguel Gates

BACK TO CONTENTS

2:00 IESB 210

Futuristic Headphones [ADVA]

Our goal is to provide an all-in-one audio entertainment system for the future. This device, ADVA, will consist of three main subsystems: RF, power, and sensor subsystems. The RF subsystem will implement Bluetooth and integrate digital design of FM radio which allows manual tuning of FM stations. The power subsystem will introduce wireless charging capabilities through the use of induction for 'charge-on-the-move' application. The sensor subsystem adds the ability to track ADVA by gathering RSSI values and notify the user to prevent loss or theft. The ADVA's Uni edition is designed to provide the convenience of movement by utilizing Arduino software and a 3D printed control wristband.

Team Name: Blaz3an
Team Members: DeJason Fowler, Arthessius Hampton, Anh Tran
Sponsor: N/A
Advisors: Dr. Matthew Hartmann, Dr. Prashana Bhattarai, Dr. Pushparaj Pathak, Dr. Jinyuan Chen, and Dr. Mickey Cox

2:30 IESB 210

Manually Integrated Battery Enclosure

We will build an enclosure centered around a programmable logic controller (PLC) which will provide the control system to a series of environmental monitoring systems. This enclosure will ultimately serve as a test bench for engineers at Sabre Industries, which constructs battery energy storage systems and the HVAC systems that maintain them. The enclosure must provide a basic monitoring system that Sabre engineers can use to test the software. The environmental monitoring system will oversee the temperature and humidity through probes and digitally simulate gas detection and smoke detection with digital switches. The system's conditions and reactions will be output through a built-in human machine interface (HMI) screen and a series of LEDs. The final project we seek to deliver will be an enclosure with a programmed PLC reading a set of inputs and appropriately reacting with a set of output LEDs and expected values on the HMI.

Team Name: Manually Integrated Battery Enclosure
Team Members: Bradley Albritton, Maggie Bagwell, Sean LeBleu, Kyle Rachal
Sponsor: Sabre Industries
Advisor: Dr. Matthew Hartmann

BACK TO CONTENTS

3:00 IESB 210

Design of Circular Array and Comparison of Bearing Estimation Algorithms

Uniform circular arrays (UCAs) offer many benefits over uniform linear arrays (ULAs) for direction-of-arrival (DoA) estimation including an increased range of measurement of the azimuth angle and the ability to measure an angle of elevation. Unlike ULAs, UCAs are disadvantaged in that their array manifold vectors do not have the Vandermonde structure which allows for convenient electronic steering of an array. This project utilized a technique to transform the array manifold vector of a UCA into a Vandermonde vector by using a Butler-type matrix [Davies, November, 1965]. This technique has been known to transform a UCA into an effective ULA. We tested this technique for simulated wide sense stationary plane-wave signals in Gaussian white noise. We also built a sixty-three microphone UCA and gathered acoustic data to test our results. We implemented conventional beamforming (CBF) and eigendecomposition-based method such as multiple signal classification (MUSIC) for DoA estimation and compared the performances. The results showed that the transformed UCA is equivalent to a ULA for MUSIC but not for CBF. CBF degenerates for particular numbers of sensors, whereas MUSIC works well for any number of sensors. However, at unrealistically high signal to noise ratios, CBF is functional.

Team Name: Circular Array Team
Team Members: Michael P. Hardin, Mindy L. Manning, Noah M. Michels
Sponsor: N/A
Advisor: Dr. Kaushallya Adhikari

3:30 IESB 210

Eco Electric Vehicle Motor Controller

The electric brushless DC (BLDC) motor design project will be the foundation for the new electric vehicle platform in the Shell Eco-marathon competition for the Louisiana Tech Eco-marathon team. The motor consists of a purpose-designed and built sensorless BLDC controller. This design is for both a senior project and the Louisiana Tech Eco-marathon team. The senior project goals consist of a self-standing and functioning 48 V sensorless BLDC motor controller. The Eco-marathon team goals consist of integrating the self-standing system into the team's vehicle, assisting in the wiring of the vehicle, and recording data gathered from testing. However, due to COVID-19, we are only able to complete the senior project goals.

Team Name: EEV Team
Team Members: Tyler Fontenot, Andrew Mashaw, Logan Stevens, Kyle Weems
Sponsor: Cyber Innovations Center of Bossier Louisiana and Eco-Car
Advisors: Dr. Matthew Hartmann and Dr. Prashanna Bhattarai

BACK TO CONTENTS

4:00 IESB 210

CubeSat Hosting Platform

CubeSats are a type of nanosatellites that are becoming increasingly popular as vehicles on which both government and private agencies conduct experiments in space. Some struggles that these groups face are the limits to both the weight and size of the payload. Our project aims to alleviate those issues by providing a common communication and power system which can be utilized by multiple CubeSats. The platform harnesses solar energy that will be used to supply adequate and reliable power. The platform contains multiple batteries to store the energy for the CubeSats and the main control system. Power and communication are both regulated from the central control system. This enables developers to focus more on the experimental portions of their design while the core elements are addressed by our project. A communication system receives information from the CubeSats and transmits it via radio waves received by a ground station. The messages from the CubeSats are encoded into QAM signals for reliable transmission and are decoded at a ground station. With the CubeSat Hosting Platform's systems in place, developers will be able to focus more on their experiments and less on the logistics. Our project will provide a valuable service to important research endeavors.

Team Name: Social Distancing
Team Members: André Aguillard, Prabin Bhattarai, Grant Ledet, Nirmal Subedi
Sponsor: N/A
Advisor: Dr. Matthew Hartmann

4:30 IESB 210

A Step Towards 6G: UAV-to-Ground Assisted Wireless Communication

Our project involves using machine learning (ML) algorithms to optimize the use and integration of drone-based platform technology into next-generation communication networks to create available internet access points and hotspots while decreasing latency and improving bandwidth for users. Drones, such as the one we will make, will be utilized to provide a low-cost solution for faster and affordable deployment to areas on-demand than setting up terrestrial stations. We will be utilizing open-source software within Python and affordable hardware such as the Nvidia Jetson TX2 and Raspberry Pi as the basis for our on-board computer for the drone and ground users, respectfully. ML algorithms will run the platform as optimally and self-sufficiently as possible while also providing network improvements to users. The project's feasibility relies on our successful implementation of optimal 3D placement and optimal flight path planning on a single platform to provide better network quality. This will require testing of different parameters, such as altitude and flight path correction. If results improve communication quality and speeds, users will have a more convenient, high-speed network with lower latency. This would be a needed improvement, as currently, no other platforms exist to solve this problem, and existing 4G infrastructure will struggle to provide these solutions for new 5G networks.

Team Name: 6G Wireless
Team Members: Christian Fredieu, Alyse Jones
Sponsor: N/A
Advisor: Dr. Jinyuan Chen

BACK TO CONTENTS

ELECTRICAL ENGINEERING

2:00 IESB 228

Guitar Amplifier

Our project was to design a small solid-state guitar amplifier that would have volume control, tone control, gain control, auxiliary input, headphone output, and a guitar amp output. Our goal for the project was to build an amplifier that has a signal-to-noise ratio, frequency response, amplifier gain, total harmonic distortion, intermodulation distortion, fast Fourier transform distortion spectrum, amplifier output impedance, and sound output as close to the Society of Motion Picture and Television Engineers standard as possible. Our methods for achieving this goal included but were not limited to, the modulation of sections of the circuit, testing various versions of the design, and using campus resources to research the best methods for implementation.

Team Name: Guitar Amplifier Design
Team Members: Aidan Fitzgerald, Jared Marcantel, David Nussbaum, Christopher Peltzer
Sponsor: N/A
Advisors: Dr. Matthew Hartmann and Dr. Prashanna Bhattarai

2:30 IESB 228

Three Phase Power Factor Metering and Correction

The goal of our project is to design a device that is capable of measuring and automatically correcting a low power factor of balanced three-phase inductive loads. Our design is intended to improve the efficiency of electrical systems by automatically compensating for the low power factor caused by inductive loads. The design utilizes an Arduino UNO microcontroller to calculate the power factor of the connected load and to control a switchable capacitor bank to correct the power factor.

Team Name: Power Factor Correction
Team Members: Nicholas Johnson, Martin Mendiola, Samuel Pepper
Sponsor: N/A
Advisors: Dr. Matthew Hartmann and Dr. Prashanna Bhattarai

3:00 IESB 228

Megohmmeter Insulation Tester

The purpose of this project is to design and implement a megohmmeter (megger) as an insulation testing device. This device will be used to test for and quantify the level of insulation deterioration for a variety of wires, cables, and electrical devices. Testing for deteriorated insulation is essential for safe, efficient operation of electrical equipment and must be executed periodically to ensure safe and proper functionality of electrical equipment and machines. This design team is constructing a portable insulation testing device that can produce a maximum DC test voltage of approximately 500 volts. The final device will include a digital output screen to display the approximate resistance of the device under test. The test voltage produced by this device is generated by rechargeable batteries and boosted with power electronics. To make this megger more helpful and useful, multiple test voltage values have been implemented to allow testing of a variety of electric machines and materials. This megger will be considered complete once it can accurately measure large known resistances with a relatively small error of <5 %. This device will benefit the designers as well as the University by providing a safe and effective method of testing the insulation in the large machines currently in use in the power lab.

Team Name: Megohmmeter Design Team
Team Members: Kyle Carroll, Toby Russell
Sponsor: N/A
Advisors: Dr. Prashanna Bhattarai and Dr. Mickey Cox

BACK TO CONTENTS

3:30 IESB 228

Variable Resistance Soft Starter

Induction machines experience large inrush currents during the initial connection to a full-rated voltage supply. While momentary, the magnitude of these currents is large enough to cause significant damage to the motor and the connecting electrical cables. Additionally, the mechanical systems being driven by the motors can suffer damage from the abrupt acceleration brought on by an instantaneous full-voltage connection. The device we've made is a variable resistance soft starter (VRSS) which limits the magnitude of inrush currents affecting 3-phase induction motors (IM). This device reduces input voltage using an automatically controlled 3-phase rheostat in series with the motor's supply line voltage. The rheostat is a combination of three single-phase rheostats with the wipers mounted on a common shaft. The rheostat shaft rotates by a small motor driven by a microcontroller. A current transformer probe is clamped around a single-phase of the motor power supply line to provide the NXP microcontroller with information about the IM input current. The microcontroller processes the rate of change in the IM current signal and adjusts the rate of change in resistance of the 3-phase rheostat to gradually bring the 3-phase induction motor up to full speed.

Team Name: Variable Resistance Soft Starter
Team Members: Tristan Becnel, Jeremy Gonzales, Taylor Moreau, Andrew Seanor
Sponsor: N/A
Advisors: Dr. Matthew Hartmann and Dr. Prashanna Bhattarai

4:00 IESB 228

Self-Driving Car Paired with Mesh Network to Share Localization Data

We aim to take self-driving cars and alter their use slightly to offer better localization by sharing data between cars in a small area. We believe that today's self-driving cars are limited in their efficiency and safety due to a lack of shared data about themselves and their surroundings. We aim to fix this by implementing data sharing over a local mesh network to allow important pieces of information to be provided for cars that otherwise would not know about it. We have approached this by first building a miniature electric car and showing that it has basic functionality such as driving around and receiving position and orientation data from a GPS and an IMU. We then built a second mini car that can communicate over a mesh network with the first one to share the most critical data. Algorithms have been developed to assist in the selection and sharing of the data over the network. We believe that the perception, and, therefore the self-driving capability of the cars, has been improved thanks to the implementation of this mesh network and the data-sharing ability given to the cars.

Team Name: Drift Kings
Team Members: Robert Brown, Owen Sutka
Sponsor: N/A
Advisor: Dr. Jinyuan Chen

BACK TO CONTENTS

1:30 IESB 210

LRPF Warehouse Design

Lockheed Martin is expecting to begin manufacturing a new product line at their facility in Camden, Arkansas, and has started construction on a building to house the new production line. Our team has been tasked with developing a floor plan for the warehouse where the unassembled components of the new product line will be managed before they are delivered to the production floor. We will create two- and three-dimensional representations of the warehouse layout to help the customer visualize the space. In addition, we will analyze the initial design to identify opportunities for cost savings through the utilization of technology. A second comparative design will be developed by implementing new technologies to better utilize the space and increase the capabilities of the warehouse. Both designs will go through a cost analysis, and recommendations will be provided for the customer.

Team Name: LRPF Warehouse Design
Team Members: Joshua Green, Laura Halbrook, Samuel Monk, Abigail Olsen
Sponsor: Lockheed Martin Missiles and Fire Control (MFC), Camden, Arkansas, with Mr. Cory Kinler
Advisor: Dr. Jun-ing Ker

2:00 IESB 210

Process Optimization at CHRISTUS Health, Shreveport Louisiana

CHRISTUS Health in Shreveport is facing multiple problems causing inefficiencies related to how crash carts are resupplied, distributed, and tracked throughout the hospital. The current method of tracking carts' locations and supplies expiration dates is relatively primitive and leaves much room for human error. Additionally, restocking the carts is deemed too time consuming. To approach these problems, our team has elected to utilize the DMAIC (Define, Measure, Analyze, Improve, and Control) problem-solving approach. Employees have been interviewed to help us identify problems, and the team has begun to brainstorm and start developing solutions to these problems as we move into the improvement phase. Our goal is to make a positive, lasting, and measurable improvement to crash cart related operations at CHRISTUS Health.

Team Name: WIP
Team Members: Leyton Burnum, Cristian Gil Bustamante, Vianka Prado Menacho
Sponsor: CHRISTUS Health, Bossier- Shreveport
Advisor: Dr. Jun-ing Ker

BACK TO CONTENTS

2:30 IESB 210

Libbey Glass Ergonomics in the Corrugated Department

Libbey Glass has asked us to look into some ergonomic concerns within the corrugated department. They specifically wanted us to reduce the strains on the consaw off-bearer and the consaw sheet-feeder. They also were interested in us looking into noise reduction within the department. There were reports of injuries in both of those positions as well as a low ergonomic score. The primary goal of our project is to reduce the number of injuries reported from the corrugated departments and to improve the working environment for the operators thus increasing their working lifespan. The main priority is to lessen the strain for the sheet feeder and offbearer. Secondary goals are to improve consaw turnover time and reduce sound level. We began our evaluations by reviewing the ergonomic evaluations that had already been completed. Then, we spoke with the operators and management within the corrugated department about what they believed caused them the most strain and difficulty. Also, we took some measurements of the noise levels throughout the department. Then, we began researching tools and methods to lessen the strain caused by repetitive motions workers typically experience.

Team Name: Libbey Glass Team
Team Members: Stephen Bass, Joshua Caver, Paige Hobson, Jeffrey Goodwin
Sponsor: Libbey Glass, Shreveport Plant
Advisor: Dr. Jun-ing Ker

3:00 IESB 210

Single Pack Improvement

At the Alliance Compressors production plant in Natchitoches, Louisiana, the single pack line is unable to meet customer demand without a large amount of unplanned employee overtime causing excess labor cost. Research shows that this has been a recurring problem, especially during peak demand. The goal of our team is to reduce this labor cost by eliminating the need for unplanned overtime by implementing the DMAIC process. Working with the existing layout we plan to shorten the cycle time of the process to reduce overall worker overtime. First, our team observed the process and conducted time studies to understand the process steps and establish a baseline for production. After analyzing the data, we believe that the single pack line process could be greatly improved by implementing a forklift notification light, assigning specific roles to workers on the line, and improving the parts tray.

Team Name: Alliance
Team Members: Rodney Alan Fulton II, Kyle McElveen, Mubarak Muhammed, Jonathan Walker
Sponsor: Alliance Compressors, Natchitoches, LA. with Mr. Craig Caskey
Advisor: Dr. Jun-ing Ker

BACK TO CONTENTS

INSTRUMENTATION AND CONTROL SYSTEMS ENGINEERING TECHNOLOGY

1:00 IESB 128

Automated Dog Kennel

Our project, the Automated Dog Kennel, addresses multiple problems for dog owners. The kennel assists with people's morning routines and makes them easier by having the dog kenneled as the people are about to leave home. Not only will the dog be kenneled securely, but he/she will receive a reward (treat) for getting in the kennel. Another problem the kennel addresses is the animal's well-being. The dog owners will be able to check on the dog throughout the day from the webcam in the kennel. We considered both the social and safety impact our project may have. We covered the social aspect by having a timer in which the owners can set to different times for the kennel to call the dog inside or let them out. This helps with people's busy lifestyles and is one less task to remember. The safety impact was our number one concern. We ensured there would be a fail-safe button if the door would not open. We also installed a camera that allows pet owners to see their animal during the day, allowing peace of mind while away.

Team Name: Automated Dog Kennel Team
Team Members: Alexander Chollette, Kyle Harris, Aaron Hightower, Savannah Sims
Sponsor: N/A
Advisor: Mr. Jonathan Niemirowski

1:30 IESB 128

Crumb Cart

The purpose of our project was to create an automated vacuum that is more efficient and cost-effective than other available options on the market. The Crumb Cart utilizes a Raspberry Pi and various sensors to autonomously maneuver around objects and navigate the floor area of the home to clean. The Crumb Cart uses a web interface to decide a run-time schedule and generated buttons so the user can control it from any device and have immediate, easy access to the robot. The web interface makes it more user friendly and allows for real-time control and monitoring of the Crumb Cart. We also decided to use a Raspberry Pi to leave it open for modification of the coding and web design so if an owner wanted to implement additional hardware or add more information, specialized cleanings, and more gadgets to the webpage, they would have the ability to do so.

Team Name: Crumb Cart Team
Team Members: Michael Bearden, Dakota Stein, Brandon Truemner, Jacob Yazbeck
Sponsor: N/A
Advisor: Dr. William Long

BACK TO CONTENTS

INSTRUMENTATION AND CONTROL SYSTEMS ENGINEERING TECHNOLOGY

2:00 IESB 128

Multimeter Glasses

On average, there are approximately 30,000 arc flash incidents recorded annually, 400 of which unfortunately result in fatalities. Our project focuses on addressing this issue by developing a method to maintain the user's attention, while also providing convenience when performing tasks in high power applications. This solution will be beneficial to the user by eliminating the need to look away from their work area while providing the multimeter readout at a glance. The heads-up display consists of additional key features, such as: a flashlight, a camera, and a WIFI development board that sends the readout and camera data online via email. Its polyethylene terephthalate glycol (PETG) filament frame is lightweight and strong while insulating the existing components inside. This project could easily help reduce the actual chances of an arc flash occurrence.

Team Name: NΩMBR3S
Team Members: Ryan Cordes, Sean Gilbert, Michael Kraemer, Cody Rogers
Sponsor: N/A
Advisor: Dr. William Long

2:30 IESB 128

The Pioneer

Since this is the very first Senior Project expo for Instrumentation and Control Systems Engineering Technology, we wanted to create a device that was totally original and showcase many of the skills we have learned in this major. We present to you The Pioneer: a wire measuring, stripping, and cutting device that allows for the process of cutting and stripping wire to be totally automated. With the use of a human-machine interface (HMI), the user tells the automation direct programmable logic controller (PLC) how many pieces of wire need to be cut/stripped and how long those pieces need to be. The main problem this device solves is reducing the time it takes to cut and strip a large amount of wire, specifically the freshmen kits that Dr. Hall makes each year. Making these kits takes a lot of time and money because a student worker cuts and strips each wire individually, while our device will do it autonomously and at a faster rate. With this device, the user will be able to feed the wire into the cutting mechanism, tap a few buttons, and have the machine do the work.

Team Name: The Pioneers
Team Members: Jacob Fredricks, Tyler McCullough, Brandon Navarre, Trey Navarre
Sponsor: N/A
Advisor: Mr. Ron Gill

BACK TO CONTENTS

INSTRUMENTATION AND CONTROL SYSTEMS ENGINEERING TECHNOLOGY

3:00 IESB 128

Smart House

Our senior design project will be a form of smart home automation. We will be controlling the cooling and lighting system of a room using a mobile device after monitoring the temperature and illumination level by using an IoT (Internet of Things) system. We will be using a form of IoT called Cayenne to control and measure four components related to our team's goal. The four components are a lightbulb, cooling fan, photoresistor, and a thermistor. These components will both control and monitor the cooling and lighting and are meant to be small scale examples of a real-world application.

Our project will be an energy-efficient and economical example of home automation. The goal of the project is to reduce the amount of money a homeowner might spend on cooling, heating, lighting, etc. using a tool (a cell phone or any device with an internet connection) that most people use regularly. It will accomplish this goal by decreasing and regulating the amount of energy consumed by using Cayenne in conjunction with the ESP8266 to constantly monitor the amount of natural light versus nonlight in the monitoring area.

Team Name: Smart House Team
Team Members: Dustin Anders, Matthew Fuller, Zachary LeDoux, Jackson Newman
Sponsor: N/A
Advisor: Dr. Nabamita Pal

3:30 IESB 128

The Auto-Spooler

Our project consists of transferring 22-gauge wire from a large manufacturer spool to a much smaller spool that can be wound up, cut at a given length, and sold in the engineering shop. The machine will use a programmable logic controller (PLC) and human-machine interface (HMI) control setup to make it user friendly and slightly automated with refilling the wire by placing a new spool being the only human interaction needed for the machine. The PLC is the brains of the device that controls and processes everything. The HMI is a touchscreen display that is used to give and receive quick commands to and from the PLC. This project is also a request from Dr. Hall that will help his student workers give organized and accurate amounts of wire to students but serves as a project to display what is possible with the equipment that is used in Instrumentation and Control Systems Engineering Technology.

Team Name: Not Found
Team Members: William Crenshaw, Jordan Fleming, Brett Gates, Joshua Sanders
Sponsor: N/A
Advisor: Mr. Ron Gill

BACK TO CONTENTS

1:00 IESB 301

Glucose Regulation Using an Intelligent PID Controller

Type 1 diabetes is a condition characterized by a lack of insulin production. This lack of insulin causes glucose concentration in the blood to increase after meals. In order to maintain blood glucose levels, diabetics must inject insulin using needles or an insulin pump. Additionally, the lack of insulin can cause glucose levels to decrease overnight. This project uses a proportional-integral-derivative (PID) controller to modify the rate of insulin and glucagon infusion when glucose levels are increasing or decreasing, respectively.

A system of 12 differential equations was used to anticipate changes in glucose concentration as insulin and glucagon were injected. The system was simulated for virtual patients over a 24-hour time span to test its feasibility in human patients. The PID controller uses the current, past, and anticipated future glucose levels, respectively, to determine the best course of treatment for the virtual patient.

One of the many difficulties in medical technology, however, is everyone is different. These differences are a result of metabolism and other factors. To account for these differences, the controller is designed to change the gain of the different controller components to better tailor the treatment to each patient.

Team Name: N/A
Team Members: Parker Willmon
Sponsor: N/A
Advisor: Dr. Katie Evans

1:15 IESB 301

The SIR Models, Their Applications, and Approximations of Their Rates

The SIR (susceptible-infected-recovered) models are used to help predict the spread of diseases. The goals of this paper are: elaborating on the methods of approximating the recovery rate, infection rate, and loss of immunity rate; comparing the SIR models with these approximation methods to real-world data, and determining the most accurate combination of the approximation methods for each SIR model. There are several SIR models such as the Kermack-McKendrick, SIRS, and SI models that are designed for specific diseases. Understanding the parameters of these models will assist us in maximizing their accuracy. For example, there is no explicit formula for any of the rates within the models. Therefore, those rates must be approximated. Using these models to represent real-world situations will explain why each disease needs to be represented by a specific model. Understanding the content and the rate approximations of each model can help determine the level of accuracy the model will have in predicting the spread of the disease.

Team Name: N/A
Team Members: Christopher Cano
Sponsor: N/A
Advisor: Dr. Stacey McAdams

BACK TO CONTENTS

1:30 IESB 301

A Novel Method for Computations of Ratios of Jet Cross Sections in Perturbative Quantum Chromodynamic

The strong interaction is the force responsible for binding quarks to form hadrons, such as protons and neutrons, and also for binding protons and neutrons to form the nuclei of atoms. The properties of the strong interaction can be studied in particle collisions from measurements of the production rates of collimated sprays of particles, called jets. In particular, the ratio of the number of collisions that produce three jets over the number of collisions that produce two jets is a direct measure of the strength of the strong interaction, which is quantified by the strong coupling constant. Determinations of the strong coupling constant from particle collider data require theoretical calculations. In this paper, a new approach for the theoretical calculations that differs from the commonly used approach is investigated. Computations of the results are presented for different ratio measurements performed at the CERN Large Hadron Collider and the Fermilab Tevatron Collider. The results of the two different approaches are compared to each other and to the results of the experimental measurements. It is discussed in which kinematical regions the two approaches agree and where they differ.

Team Name: N/A
Team Members: Connor Waits
Sponsor: N/A
Advisor: Dr. Markus Wobisch

1:45 IESB 301

Forecasting Daily Stock Market Return with Multiple Linear Regression

The purpose of this project is to use data mining and big data analytic techniques to forecast daily stock market returns with multiple linear regression. Using mathematical and statistical models to analyze the stock market is important and challenging. The accuracy of the final results relies on the quality of the input data and the validity of the methodology. In the report, within a 5-year period, the data regarding eleven financial and economical features are observed and recorded on each trading day. After preprocessing the raw data with the statistical method, we use the multiple linear regression to predict the daily return of the S&P 500 Index ETF (SPY). A model selection procedure is also completed to find the most parsimonious forecasting model.

Team Name: N/A
Team Members: Shengxuan Chen
Sponsor: N/A
Advisor: Dr. Xiao Zhong

BACK TO CONTENTS

2:00 IESB 301

The Shallow Water Equations

For this project, we are doing research on the shallow water equations: a set of hyperbolic partial differential equations. These equations exist as a set of three primary equations. However, there is another version of the shallow water equations called the Saint Venant's equations. These equations are similar to the standard shallow water equations but are reduced to one-dimension. The primary goal of our research is to investigate the behavior and mathematical construction of the Saint Venant's equations and model these equations using COMSOL. Regardless of the equation type, standard or Saint Venant's, it is useful to note that these equations are only applicable under some restrictions such as hydrostatic balance and the distance from one crest to another, on any two waves, must be greater than the distance from the free surface to the sea floor (bottom topography). These restrictions, along with initial conditions, are also a target in this research, and these conditions and equations can help with flood predictions and regulations not only now, but also in the future.

Team Name: N/A
Team Members: Chase Jones
Sponsor: N/A
Advisor: Dr. Weizhong Dai

2:15 IESB 301

The Theory of Cryptography In BTcoin

Bitcoin is a well known virtual currency, or cryptocurrency. It was created by a group of people using the name Satoshi Nakamoto in 2008. Currently, many people are utilizing Bitcoin for personal gains and transactions. To keep transactions secure requires techniques from modern cryptography. In this paper, we explain certain aspects of the cryptography of Bitcoin. We are going to discuss two components of the cryptography of Bitcoin—hash functions and signatures. We will describe what the hash function and signature are, give some examples of hash functions, and discuss certain criteria that good hash functions should satisfy.

Team Name: N/A
Team Members: Can Hong
Sponsor: N/A
Advisor: Dr. John Doyle

BACK TO CONTENTS

2:45 IESB 301

Impact of Eating and Sleeping Prior to Test Taking

This paper addresses an ongoing issue that many high schools nationwide are having with low test scores in mathematics. There are many different factors that could be contributing to this problem. Questions that we must ask in solving this problem are whether what a student eats and how much sleep they receive are factors?" If the answers to these questions are yes, how beneficial would it be to be able to assist students in their academics by teaching them about the best times to eat and how to improve sleep habits to improve their test scores? Students long for an easy yet efficient way to improve their mathematics test scores, and knowing the best times to eat and sleep could lead to a simple plan that could help without adding additional classroom work or study time. A survey is given to students prior to testing to identify whether they ate and how much sleep they received prior to their exam. The goal of this project is to research and extract data on whether or not eating prior to taking a test is associated with higher mathematics test scores among high school students while also taking sleep into account.

Team Name: N/A
Team Members: Cassidy Meadows
Sponsor: N/A
Advisor: Dr. Brian Barron

3:00 IESB 301

Periodic Points and Sharkovsky's Theorem

The number of periodic points of a function depends on the context. The number of complex periodic points and rational periodic points have been shown to be infinite and finite, respectively, if f is a polynomial of degree at least 2. However, the number of real periodic points can be either finite or infinite. Sharkovsky's Theorem states that if p is left of q in the "Sharkovsky ordering" and the continuous function f has a point of period p, then f also has a point of period q. This statement becomes very powerful when considering a function that has points of period 3, all the way to the left side of the Sharkovsky ordering, since having a point of period 3 implies the existence of points of all periods. We explore a continuous function with points of period 3 where the function can be restricted to an interval containing points of period all other natural numbers.

Team Name: N/A
Team Members: Luke J. Seaton
Sponsor: N/A
Advisor: Dr. John Doyle

BACK TO CONTENTS

3:15 IESB 301

The Prediction of Fantasy Football

In this paper, we consider the game fantasy football, which allows people to simulate being a National Football League team owner. Imaginary owners select from the best players in the NFL and compete on a weekly basis based upon player performances on the field. Fantasy football has become popular over the years. In 2011, according to the Fantasy Sports Trade Association, there were 35 million people that played fantasy sports online in the United States and Canada. Some of the major companies that use fantasy football are Yahoo, ESPN, and the NFL, although there are more platforms. Many people use these platforms to view NFL reporting, preseason rankings, player statistics, fantasy points projections, and expert opinions on drafts. Even though fantasy sports have increased over time and there are various platforms to view stats and predictions, there is no method that provides a strategy to predict the entire fantasy football league.

During this project, we will predict NFL players' performances on the field and calculate their fantasy points for the next season using the auto regression integrated moving average (ARIMA) models using players' historical data. We will use the data from these predictions and an algebraic equation to rank players by overall fantasy prediction points for the 2020 fantasy draft.

Team Name: N/A
Team Members: Chelsea Robinson
Sponsor: N/A
Advisor: Mr. Stanley McCaa

3:30 IESB 301

The Axiom of Choice and Related Topics

This project covers the axiom of choice and two mathematical statements which are equivalent to it. The axiom of choice is an axiom of Zermelo-Fraenkel set theory that states that given a collection of non-empty sets, there exists a choice function which selects one element from each set to form a new set. The equivalents of the axiom of choice that are discussed in this project include Zorn's Lemma, which states that a partially ordered set with every chain being bounded above contains a maximal element, and the Well-Ordering Theorem, which states that every set has a well ordering. In addition to proving the equivalence of these statements, this project explains the mathematics required to prove them individually, as well as various mathematical consequences of the statements.

Team Name: N/A
Team Members: Bryan McCormick
Sponsor: N/A
Advisor: Dr. John Doyle

BACK TO CONTENTS

3:45 IESB 301

Strategies and Algorithms of Sudoku

This paper discusses different strategies for the game of Sudoku and how those strategies relate to other problem-solving techniques while also attempting to use those other techniques in a way that improves the strategies for Sudoku. This includes a thorough analysis of the general algorithm and an algorithm that is formed by the Occupancy Theorem and Preemptive Sets. This paper also compares these algorithms that directly relate to Sudoku with algorithms to similar combinatorial problems such as the Traveling Salesman problem and more. With the study of game theory becoming more popular, these strategies have also been shown to help students in various ways in the classroom. To understand Sudoku on a deeper level, this paper demonstrates ways to model a puzzle by using permutation matrices and different symmetries.

Team Name: N/A
Team Members: Callie Weaver
Sponsor: N/A
Advisor: Dr. Stacey McAdams

4:00 IESB 301

Bridge to Bulldogs: A Student and Financial Analysis

In this paper, we discuss the statistical analysis of the Bridge to Bulldogs program. The program provides prospective students, who do not meet all of the admission requirements, an alternate route of admission to Louisiana Tech University. It is offered over two consecutive quarters, either summer/fall or fall/winter. During the program, students focus on building their math skills through tutoring and special advising. We compare the Bridge students to other first-time freshmen in relation to scores in freshman-level math classes. We also compare composite and Math ACT scores. Finally, we perform a financial analysis, including retention rates, to determine if the Bridge to Bulldogs program is financially beneficial to the university.

Team Name: N/A
Team Members: Rebekah Moss
Sponsor: N/A
Advisor: Cassidi Jacobs

4:15 IESB 301

Predicting and Comparing the Stock Value of Chick-fil-A

This project focuses on estimating the stock value of Chick-fil-A as if it were a publicly traded company using a comparable analysis method or CAM. We begin by obtaining financial information from Chick-fil-A as well as the number of locations there are chain-wide. Next, we find two publicly-traded fast food companies, one that is larger than, and another that is smaller than Chick-fil-A and obtain the same information from them. The idea is that Chick-fil-A will lie between these two companies, and we can use the CAM to estimate their stock value. The CAM gives us a multiple of the valuation of Chick-fil-A in comparison to the companies we use and that information is used to estimate the stock value. Lastly, we can compare Chick-fil-A with the larger company and then with the smaller company and average the two values which will give us a more accurate estimate.

Team Name: N/A
Team Members: Mark Yates
Sponsor: N/A
Advisor: Mr.Stanley McCaa

BACK TO CONTENTS

1:30 IESB 112

Propellant Mixing Stand

Aerojet Rocketdyne entrusted us to design a platform inside one of their propellant mixing buildings. The purpose of this platform is to introduce a vibratory machine into their patented mixing process. This machine will improve the overall efficiency, safety, and cost-effectiveness of their propellant mixing process. When developing the design for this project, our team considered the following constraints: a confined space to install the platform, an appropriate operating space, a maximum deflection of 0.031 inches for any member of the platform, and specific materials due to the combustibility of the propellant. Our main concern was providing enough support beneath the floor of the platform to deflect less than the allowable amount under a worst-case loading scenario. The maximum deflection of the support beams is 0.026 inches. A buckling and frequency analysis was also conducted, and both resulted in satisfactory performance given our project constraints.

Team Name: N/A
Team Members: Ryan Black, Michael Clark, Jaeson Hall, Christopher Palm
Sponsor: Aerojet Rocketdyne, Camden, AR
Advisor: Dr. Shawn Sun

2:00 IESB 112

Bagger Tube Lift System

The Bagger Tube Lift System is a device that assists workers in installing and removing bagger tubes from the bagger machines at a sweet potato plant. Bagger tubes funnel in sweet potato fries from a chute above, and the bag is formed around the outside of the tube. At the base of the 42-inch bagger tubes, the bag is sealed and released onto a conveyor for further processing. Bagger tubes must be changed for cleaning and resizing of bags. Each 75-pound bagger tube must be moved across the facility, then raised and lowered 37-inches between storage rack and mounting position within the bagger machine. The bagger tube lift system provides safety, with fewer and more guarded pinch points, and is operated entirely using a control panel. The system also allows installation and removal to be conducted faster than the current method.

Team Name: N/A
Team Members: Stuart Dunlap, Joseph Pusateri, Dylan Sequeira, Colton Tomlin
Sponsor: Lamb Weston, Delhi, Louisiana
Advisor: Dr. Arun Jaganathan

BACK TO CONTENTS

2:30 IESB 112

Ergonomic Panel Grinder

During the fabrication of steel panels, a manual grinder is used to remove burrs and weld debris that have formed on the panels. Because employees must wield the heavy grinder for extended periods, a hoist-limiting boom has been installed which effectively reduces the weight of the grinder by 85%. Unfortunately, the boom is only effective when the grinder is parallel with the ground, and it is often necessary to operate the grinder at an angle in order to eliminate burrs on the edges of panel. Additionally, the boom requires a great deal of effort to reposition due to its large mass. To fix the first issue, a new harness has been installed on the grinder which enables free rotation of the grinder while reducing its effective weight by 85%. To fix the second issue, the boom was divided into smaller sections to reduce the force required by the operator to adjust its position.

Team Name: N/A
Team Members: Kash Keith, Colby Rybicki
Sponsor: A.J. Weller Corporation, Shreveport, LA
Advisor: Dr. Henry Cardenas

3:30 IESB 112

Satellite Threat Neutralization

Satellites are heavily relied upon in the public, private, and military spheres of society. Due to this continuously increasing reliance, satellites are progressively more vulnerable targets to directed energy weapons (DEWs). To defend satellites, defense systems must be designed that address the size, weight, and power constraints endemic to space operation. This project scope requires a proof-of-concept thermal defense system for small satellites. This system should be able to sense and respond to concentrated thermal energy threats from a DEW. To be considered successful, the defense system must be able to withstand an incident heat flux of at least 2.5 W/cm2 over a diameter of a 25 mm spot-size for 30 continuous minutes. The system must be able to maintain a surface temperature below 200oC across the satellite surface. It must be able to absorb thermal energy and then discharge it once the attack has passed. It is important that the system be able to adapt to a randomly changing location of attack.

Team Name: N/A
Team Members: Celeste Ewertz, Luke Hansen, Caleb Swafford, Kathryn Trimm
Sponsor: N/A
Advisor: Dr. Arden Moore

BACK TO CONTENTS

4:00 IESB 112

Skidder Tire Mount Frame

This project involves the design and construction of an apparatus to mount and secure large skidder wheels in order to provide the leverage necessary for tire removal. Skidders are large vehicles used in forestry to haul felled trees. Their tires can have diameters of up to 80 inches, and the wheel assembly can weigh up to 2000 pounds. The scale of these tires makes them difficult to work with while lying on the ground, taking 2-3 shop workers several hours to remove a tire from the rim. Mounting the wheels vertically aids in this process, allowing one or two operators to perform this procedure in just an hour. In addition to the large load that the apparatus needs to withstand, the wide variety of skidder sizes and manufacturers necessitated the mounting stand's ability to interface with different sizes of wheels and those with varying lug bolt patterns. This is accomplished through the use of a hydraulically actuated sled to interface with the central hole in the wheel's rim (pilot hole). Since the lug holes cannot be used directly to restrain the tire, chains with attached hooks will provide the restraint needed during service operations.

Team Name: N/A
Team Members: Matthew Bryant, Jaret Gillum, Peter LeBoeuf, Daimen Moody
Sponsor: Walpole Tire, Ruston, LA
Advisor: Dr. Krystal Corbett

AWARDS AT 5:00

BACK TO CONTENTS

1:30 IESB 114

Automated Sand Bagger

The automated sandbagging system consists of a screw conveyor enclosed in a tubular case that is mounted on a trailer at a 20° angle. This angle is convenient for the sand to flow well. Once the screw conveyor is pushed into the sand pile using two linear actuators, sand will flow up the conveyor and fall into a loading chute where the sand will be bagged for disaster relief. The entire system is powered by a gas generator that is located on the trailer. For the project to be deemed successful, the entire process should not involve an operator shoveling sand into the screw conveyor. This project may benefit many people in a time of crisis, as it will significantly reduce the time and energy needed to make numerous sandbags.

Team Name: N/A
Team Members: Brett Bergeron, Robert Blewer, Sahil Desai, and Zackary Schexnider
Sponsor: Hayes Manufacturing, Pineville, Louisiana
Advisor: Dr. Ethan Hilton

2:00 IESB 114

Cooling Tower Filter Crain

The CLECO Acadia Power Station, located in Eunice, Louisiana, is a steam power plant which contains a cooling tower where the steam is condensed into water and sent to pumps that circulate the water throughout the plant. These pumps handle a massive quantity of water that must be filtered through a series of filter screens (approximately 20 feet tall) to ensure efficiency and reliability. The filter screens must be cleaned regularly, and the current process is cumbersome, requiring a crane and two operators to complete. The purpose of the project is to design a permanent, electrically powered overhead crane system designed specifically for these screens that can be operated by a single operator and to transport the screens efficiently and safely to the designated cleaning area and back. The surrounding area currently contains no structural members that can be utilized for the system, so a structure must be designed that can withstand any loads imparted on it due to the lifting and moving of the screens, and an effective system for lifting and moving the screens must be specified. A successful project will result in decreased labor to perform the cleaning process and increased convenience for the operator performing the task.

Team Name: N/A
Team Members: Austin Crawford, Ethan Desforges, Blake Sockrider, Jacob Stewart
Sponsor: CLECO Acadia Power Station, Eunice, Louisiana, Mr. Darrian Duncan
Advisor: Dr. Ethan Hilton

BACK TO CONTENTS

2:30 IESB 114

Crushing Wheel Gantry System

The senior design team has been assigned to Cleco Power LLC's Crushing Wheel Gantry System project. This project is located at the Brame Energy Center in Lena, Louisiana. Cleco Power LLC's current operation of opening and closing doors on a coal pulverizing tower is unsafe and time consuming. The current system has an equipment change during the opening and closing process of a 45,850 pound door, creating a safety hazard. With safety as the main priority, the team will design a new system that opens and closes the doors in one continuous motion, eliminating the equipment change and negating the safety hazard. Designing this new solution has space limitations due to the various equipment surrounding the pulverizing towers. The design team must provide Cleco Power LLC with a fully functional prototype, a complete bill of materials, a set of standard operating procedures, and all drawings that were created.

Team Name: N/A
Team Members: Hunter Buchner, Katherine Coleman, Grant Jones, Colton Phillips
Sponsor: CLECO Power, Brame Energy Center, Lena, LA., with Mr. Jeremy Brimer and Mr. Wynn Rodgers
Advisor: Dr. Timothy Reeves

3:30 IESB 114

Micro Mullion Mate

Within a large window, the metal pieces that hold individual panes of glass within the frame are collectively referred to as the mullion. When renovating or remodeling a building, it is sometimes necessary to add a wall that intersects at a window. Because the glass and mullion is usually set back from the surface of the wall, there is often a gap between the mullion and the new wall. Gordon, Inc, has designed a line of Mullion Mate products that are designed to be placed into this gap and then mechanically expanded to fill it. However, the smallest Mullion Mate that they offer cannot fit into a gap smaller than 2.75 inches. This project is focused on developing a smaller Mullion Mate that can be used to fill a gap from 2 to 3 inches while keeping the appearance similar to that of Gordon, Inc.'s existing product line.

Team Name: N/A
Team Members: Kyle Beardsley, Gary Coty IV, Andrew Huck, Lucas Waldron
Sponsor: Gordon Architectural Products with Mr. Eric Sorensen
Advisor: Dr. Louis Reis

BACK TO CONTENTS

4:00 IESB 114

Dyno-Balanced Beater Bar

Frosty Factory produces frozen drink machines that are sold globally. The beater bar being used for their frozen drink machines with a 9-inch diameter barrel is not dynamically balanced and causes the machine to oscillate or vibrate when the machine is on. This vibration is significant enough to cause premature seal failure. Premature seal failure allows frozen drink mixture to leak into the core of the machine, damaging motors and cooling components. In extreme cases, the vibration can cause the machine to walk into other machines or off counters. The Senior Project Team for this project has made changes to the beater bar that make the beater bar dynamically balanced. These changes reduce the vibration and will improve seal life as well as prevent machines from walking off counters.

Team Name: N/A
Team Members: Macaila Bell, Gregory Gobrogge, Trace Ramsey, and Brice Soignier
Sponsor: The Frosty Factory, Ruston, LA
Advisor: Dr. Kelly Crittenden

4:30 IESB 114

High STC Mullion Mate

This project consists of researching, designing, and manufacturing a Mullion Mate with a sound transmission class (STC) that is higher than 60. A mullion mate is a spring and insulation-filled aluminum extrusion that encloses the vertical gap between partition walls and windows. A sound transmission class is the measure of how difficult it is for sound to travel through material. Therefore, a high STC means less sound transmits through the material. This is important within the scope of this project because it allows for the product to be implemented within infrastructures where confidential information is discussed. The project was broken down into two main components: insulation materials and the aluminum housing. This required research through the construction of an anechoic chamber and 3D printed models of the housing. In the design of the Mullion Mate, the team took into consideration the cost limit of $40 per ft., aesthetics, and ease of installation. The final design consists of two 1″ thick extrusions which vary in width depending on the gap between the given set of partition walls and windows. This new design has tested very well in our anechoic chamber and is expected to meet the 60 STC rating.

Team Name: N/A
Team Members: Karla Debrae-Godinez, Joel Murphy, Leland Smith, Ryan Willy
Sponsor: Gordon Architectural Products, Bossier City, LA
Advisor: Dr. Krystal Corbett

AWARDS AT 5:00

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BACK TO CONTENTS

1:30 IESB 122

Crack Arrest Treatment System

Cracks in pipes, which form in harsh, high-load environments, affect many industries today. This damage causes problems for American Electric Power Company (AEP) such as extreme danger and unscheduled downtime. Due to the danger and costs associated with pipe failure, AEP desires a more efficient and economical method to fix the cracks, or stop their propagation. Research done at Louisiana Tech University has revealed a potential method to extend the life of damaged pipes by filling cracks with electroplating material, helping to resist crack propagation, which prolongs the life of the treated pipe. The Crack Arrest Treatment senior project team has developed a model treatment system that mimics how this research could be implemented in power plants. The mobile treatment cart and ten-foot pipe system help the team investigate the validity and usefulness of the research for AEP. By examining changes in the pipe's material properties and visual inspections with microscopic cameras, the degree to which the cracks are filled can be evaluated and reported to engineers at AEP. Successful implementation of this treatment system will improve the safety, reliability, and long term cost of many of the systems in place throughout AEP's power plants across the nation.

Team Name: N/A
Team Members: Harlee Moss, Jonathan Sedlacek, Paige Stansbury, Samantha Villarreal
Sponsor: American Electric Power Company, Shreveport, LA
Advisor: Dr. Arden Moore

2:00 IESB 122

High-Efficiency Fan Filter Unit

A fan filter unit consists of a fan motor which forces air through a high-efficiency particulate filter (HEPA) into a cleanroom environment. The goal of this project is to improve the energy efficiency of a fan filter unit by using a new fan motor that has a larger air intake capacity as well as an optimized motor housing. If companies that utilize fan filter units to maintain a clean room environment had more efficient energy consumption, their overhead costs would decrease and therefore, the cost of production would decrease. Some types of clients that require cleanrooms include semiconductor and pharmaceutical manufacturers. Lowering the overhead for these products may enable them to be sold at lower costs. The constraints are to make the unit height as compact as possible while maximizing energy savings by utilizing a new fan motor. As of now, the design exhibits a 28-watt power consumption at average operating conditions. This number is compared to a consumption of 113 watts for the previous design. This is a 75% improvement in energy consumption.

Team Name: N/A
Team Members: Shailendra Bhattarai, Zackary DeYoung, Jose Soto, Mason Wixson
Sponsor: Gordon Architectural Products, Bossier City, LA., with Mr. Danny Smiley
Advisor: Dr. Eric Borquist

BACK TO CONTENTS

2:30 IESB 122

Hitch Cargo Carrier

The Hitch Cargo Carrier aims to solve an increasing problem caused by decreasing vehicle sizes. Cargo space is sacrificed as vehicles are designed to be more compact. This project will offer a simple solution to increase the cargo capacity of a vehicle by utilizing the vehicle's hitch receiver. The structure will be roughly the size of a typical home refrigerator unit and will mount to the vehicle through the hitch receiver. A sliding mechanism is used for easy loading and unloading of the structure by a single person. The structure will hold at least 150 lbs of cargo, allow easy rear door access, and will not reduce the fuel efficiency of the vehicle by more than 20%. The Hitch Cargo Carrier is a solution to easily increase the cargo space of a vehicle.

Team Name: N/A
Team Members: Grant Camara, Michael Neff, Jarod Sexton-Davis, Justin Sutton
Sponsor: Excellence and Innovation in Motion, West Monroe, LA., with Mr. David Gremillion
Advisor: Dr. Louis Reis

3:30 IESB 122

Diversion Tote Control System

Lamb Weston's sweet potato plant in Delhi, Louisiana, has problems with spillage of product in their overflow line. Sweet potato fries are sent to the overflow line whenever they cannot be bagged so that they can be bagged at a later time. The overflow line brings the fries to a shaker and the fries fall into one of four large totes that can hold 800 pounds of fries. The four hatches that let the fries fall into the totes are controlled manually by a switch at each hatch, despite the fact that no worker is actually stationed at the overflow line. The totes are placed under the shaker without much uniformity and tend to form lumped up piles that can cause spillage even before the totes are actually full. This projects goal is to alleviate these problems by restricting the tote placement area, by providing sensors, and auto-lighted alerts that personnel can respond to whenever the tote is too full, either by weight or by lumped up product height. In addition, a clear path to automate the hatches will be given to Lamb Weston from the information that the control system will collect regarding the state of fill of the totes.

Team Name: N/A
Team Members: Matthew Mitchell, Matthew Mueller, Ryan Rothenberger, Jason Wallette
Sponsor: Lamb Weston, Delhi, Louisiana
Advisor: Dr. Timothy Reeves

BACK TO CONTENTS

4:00 IESB 122

Contingency Cut-Off Tool

OneSubsea, a Schlumberger Company, produces products that are used to extract oil and natural gas from sub-sea well heads. This project focuses on one product specifically, the OneSubsea Clamping System – Vertical, hereby known as the OCS-V. The OCS-V is a large clamp used to securely connect massive pipes to various components on the sea floor. The OCS-V employs a 2″ diameter lead-screw, similar to a large bolt, that draws the clamp closed when tightened. This lead-screw is made of inconel, a very advanced nickel alloy. However, over decades of use, this lead-screw has the potential to develop calcium-like deposits on the threads. This deposit can make it impossible to disengage the clamp. In the event that the clamp becomes inoperable, the lead-screw must be cut. The Contingency Cut-Off Tool, or CCOT, does just this. It is a hydraulically powered circular saw that utilizes a 14″ blade to cut through the lead-screw. Since this operation must occur on the sea floor, a remotely operated vehicle must be used to perform all required work. This CCOT was strategically designed to be mounted to an OCS-V, intentionally minimizing room for error, to accurately and effectively perform the required cut.

Team Name: N/A
Team Members: Bryan Hagans, Josef Harrison, Luke Moreau, Elijah Steadman
Sponsor: OneSubsea, a Schlumberger Company
Advisor: Dr. Michael Swanbom

4:30 IESB 122

Turbine Distress Simulation Tool

Billions of people across the world rely on power plants for energy which often use turbines to generate electricity. A turbine consists of a rotating shaft, or a rotor, with blades that extract power from expanding gasses. Typical rotors are more than 2 feet in diameter. After maintenance, turbines may experience a phenomenon called "partial rub" in which the rotor of the turbine contacts components in its housing. Partial rub is not detrimental to performance, though it may trigger the control system to shut down the turbine due to abnormal vibration. If operators are trained to identify partial rub and override a shutdown triggered by it, they could save power companies millions of dollars per day. Bently Nevada has tasked the team with recreating the partial rub effect on the rotor kit, a 10-millimeter diameter scale model, for use during classroom demonstrations for operators and engineers. Bently Nevada provided the team with data collection equipment used in real power plants to analyze vibration behaviors on the rotor kit. The team presents two designs that cause partial rub and analyzes the effects of this rub on the rotor kit through the data collection system.

Team Name: N/A
Team Members: Ryan Schaefer, Andrew Vidrine, Abigail Walker
Sponsor: Bently-Nevada Corporation, Vicksburg, MS., with Mr. Michael Titone
Advisor: Dr. Kelly Crittenden

AWARDS AT 5:00

BACK TO CONTENTS

1:00 IESB 126

HydroGuard

Athletes perform at their highest level when they are properly hydrated. Collegiate sports programs do not currently have a way to accurately measure an athlete's hydration in real-time. It is left up to the athletes themselves to ensure that they are properly hydrated. The HydroGuard will take the guess-work out of assuring a team that its athletes are ready to perform at the highest level. It will measure every athlete's hydration levels in real-time. When an athlete loses 2% of their body weight in sweat their performance can decrease by up to 40%, and if an athlete loses a 5% equivalent of their weight, they will be subject to cramps. The HydroGuard will assist athletic trainers in tracking hydration levels of the entire team and will notify trainers when an athlete is approaching low levels of hydration.

Team Name: N/A
Team Members: Alisha Brown, Christopher King, Oliver Powell, Ethan Reed
Sponsor: N/A
Advisor: Mr. Tom Futrell

1:30 IESB 126

OHP Cool Panels

Solar power has been a rapidly growing industry as of late. One thing that most people do not know is that solar panels never generate the power they are rated for due to the overheating of the photovoltaic cells. This overheating equates to an efficiency loss of approximately 10-15%. Although there are already some solutions to this problem, none are capable of passively cooling solar panels. In other words, there are no solutions to this problem that do not require additional energy input.

Our goal for this project is to design and develop a passive cooling solution that will reduce the efficiency loss due to overheating of the photovoltaic cells. In order to complete this, we are proposing the utilization of an oscillating heat pipe (OHP). This is a device consisting of capillary tubing with turns in a serpentine pattern. This device is partially filled with a working fluid that allows for two-phase heat transfer to occur between the solar panel and a semi-infinite medium. Our goal for this device is to reduce the effects of overheating of solar panels by approximately 8%.

Team Name: N/A
Team Members: Matthew Cambre, James Danley, Jahkia Green, Joshua Richardson
Sponsor: N/A
Advisor: Dr. Arden Moore

BACK TO CONTENTS

2:00 IESB 126

Superior Pressure Applying Tourniquet (S.P.A.T.)

Our product, Superior Pressure Applying Tourniquet, or S.P.A.T., is a quick -acting tourniquet. Applied to a bleeding limb, S.P.A.T. can stop blood flow in five seconds. Unlike current tourniquet models, S.P.A.T. requires virtually no training or skill to use, which is paramount to a useful emergency device. Additionally, one may apply this tourniquet to oneself with no issue. S.P.A.T. looks similar to a common blood pressure cuff but is thinner. It can accommodate a wide variety of limb sizes like a pressure cuff can. It is placed on the injured limb and secured using Velcro straps. To deploy S.P.A.T., one must activate the quick release system. The product inflates by itself until the user manually stops inflation. In the event the quick release system does not deploy the tourniquet, S.P.A.T. also contains a hand pump as a manual backup system.

Team Name: Quicknetics
Team Members: Hansel D'Cruz, Derek Delo, Eva Dickenson, Breton Green, Wariebi Suobo, Cameron Surratt
Sponsor: N/A
Advisors: Dr. Kelly Crittenden, Ms. Debbie Inman

2:30 IESB 126

Cooling Unplugged

Cooling Unplugged looks to bring "swamp cooling" technology to the modern farmer in an all-in-one display and preserver for their leafy greens. It is an ice-chest-sized display case that keeps leafy greens at their freshest by regulating both temperature and humidity while also having a clear front to display the product at farmers markets. Cooling Unplugged utilizes "swamp cooling" technology that acts like a produce cooler from the supermarket inside the box. In order to maintain the ease of portability, the product has the ability to be battery powered and therefore eliminate the need for a plug-in power source. Cooling Unplugged also comes in a cubic design which allows for multiple products to be stacked and arranged for any variety of produce or transportation method.

Team Name: N/A
Team Members: Emily Bourgoyne, Jenny Chapman, Patrick Hernandez, Ryan Vedros
Sponsor: N/A
Advisor: Dr. Ryan Freling

BACK TO CONTENTS

1:00 IESB 308

In-Situ Laser Annealing for Fused Deposition Modeling

Fused deposition modeling (FDM) is a type of additive manufacturing in which layers of thermoplastic filament material are heated and extruded upon each other to fully form 3D printed objects. Annealing is the process of heating material, then allowing it to cool evenly, thereby removing internal stresses and making the material stronger. The purpose of this project is to combine laser annealing with the 3D printing process to produce stronger 3D prints. Currently, 3D prints must be strengthened by an additional process before commercial application. Reducing or eliminating the need for these time-consuming and expensive steps will save valuable resources. The in-situ system will give a 3.5 Watt laser 360° access to a printed base layer in the X-Y plane in order to heat up the thermoplastic filament to glass transition temperature to increase interlayer bonding without allowing the thermoplastic to warp. By heating the base layer, interlayer adhesion strength can be increased, as currently extruding filament will reflow to better adhere to the newly extruded layer. This in-situ annealing process is achieved by designing and manufacturing a modified extruder carrier which mounts the laser so it can revolve with precise control around the extruder nozzle.

Team Name: Lasers and Fused Filament Extrusion
Team Members: Samuel Evans, Andrew McGuinness, Arjun Patel, Kiran Seetala
Sponsor: National Center for Advanced Manufacturing (NCAM)
Advisor: Dr. Adarsh Radadia

BACK TO CONTENTS

2:00 IESB 308

Modeling A/C Conductivity in Nanocomposites Materials

The modeling of electronic components has been going on since the birth of electromagnetism, but the development of novel materials with highly unusual properties demands the continued revising of existing models and the implementation of new ones. A model that combines Monte Carlo and mean field theory able to predict the macroscopic electronic properties of nano-composite materials, under an alternating field, based on known properties of the nanoscopic component materials is proposed and developed. This is done by a combination of Coulombic interactions for fine grain effects and classical electrodynamics to generate a mean field. The program is implemented using GPUs to reduce computational time and memory latency.

Team Name: N/A
Team Members: Lewis Johnson
Sponsor: N/A
Advisor: Dr. Pedro Derosa

2:30 IESB 308

Synthesizing Scintillation Materials of Lanthanide Complexes for Thermal Neutron Detection

For this project, we will use lanthanides coordinated with organic ligands as scintillation materials to detect neutrons and study their effectiveness. Moreover, the complexes will be doped into a PMMA matrix. The design principles learned from these complexes will be used to develop new scintillation materials characterized by higher emissive yields, fast decay times, and simple production.

Team Name: N/A
Team Members: Carlotta Cartelli
Sponsor: LaSpace
Advisor: Dr. Elisabeth Fatila

BACK TO CONTENTS

3:00 IESB 308

A Novel Method for Computations of Ratios of Jet Cross Sections in Perturbative Quantum Chromodynamics

The strong interaction is the force responsible for binding quarks to form hadrons, such as protons and neutrons, and also for binding protons and neutrons to form the nuclei of atoms. The properties of the strong interaction can be studied in particle collisions from measurements of the production rates of collimated sprays of particles, called jets. In particular, the ratio of the number of collisions that produce three jets over the number of collisions that produce two jets is a direct measure of the strength of the strong interaction, which is quantified by the strong coupling constant. Determinations of the strong coupling constant from particle collider data require theoretical calculations. In this paper, a new approach for the theoretical calculations that differs from the commonly used approach is investigated. Computations of the results are presented for different ratio measurements performed at the CERN Large Hadron Collider and the Fermilab Tevatron Collider. The results of the two different approaches are compared to each other and to the results of the experimental measurements. It is discussed in which kinematical regions the two approaches agree and where they differ.

Team Name: N/A
Team Members: Connor Waits
Sponsor: N/A
Advisor: Dr. Markus Wobisch

BACK TO CONTENTS

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