FALL 2015

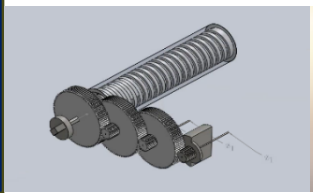
DISCOVER DESIGN DEVELOP DELIVER

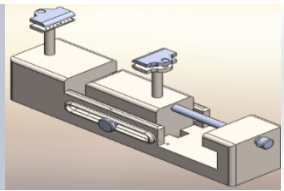
Senior Design Projects

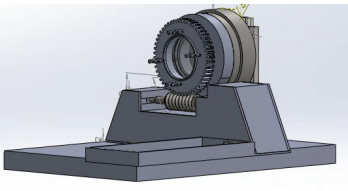
Biomedical Engineering Technology Expo and Competition

Thursday, December 3, 2015
8:00 a.m. – 12:30 p.m.
FIU Engineering Center

FIU | Biomedical Engineering
Florida International University







DISCOVER DESIGN DEVELOP DELIVER

SENIOR DESIGN PROJECT AGENDA

8:00am	Breakfast
8:40am	Welcome by Dr. Wei-Chiang Lin, BME Interim Chair and Associate Professor
8:50am	Introduction and Orientation by Dr. Anthony McGoron, Associate Dean of Academic Affairs and BME Professor
9:00am	Team 1: Multi-Sample Device for FT-IR Spectroscopy *Sponsor: BioTools*
9:30am	Team 2: Modeling Adhesion Performance of Transdermal Systems *Sponsor: AVEVA*
10:00am	Team 3: Novel Stent Design for Peripheral Vascular Stenosis *Sponsor: BMC Medical Manufacturing*
10:30am	Team 4: Chemically Induced Oxygenator *Sponsor: APEX Medical*
11:00am	Team 5: Pressure Map Sensor Device for Syntheon Knot Tyer Mechanism *Sponsor: Syntheon*
11:30pm	Judges Deliberations and Lunch (BME Conference Room)
12:30pm	Senior Design Award Ceremony and Reception

Discover Design Develop Deliver

Message from the Chair

Congratulations Seniors!

As senior Biomedical Engineering students at Florida International University, you have come to the end of an incredible journey. Your Senior Design Projects are a reflection of your efforts and your capstone undergraduate experience.

Your work is an illustration of the many skills you have sharpened during the course of this yearlong project. You have discovered new ways of thinking, designed and developed an engineering solution for a practical problem, and collaborated with your teammates to deliver innovative solutions. It is encouraging to see your accomplishments and to have witnessed your growth as students.

As you embark on the next stage of your education and careers keep the confidence that comes from having enhanced your knowledge, remain inquisitive and have the courage to achieve your dreams.

Wei-Chiang Lin
December 2015

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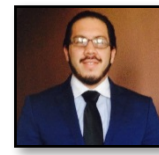
Fall 2015
Senior Design Projects

Multi-Sample Device for FT-IR Spectroscopy

Team 1: Walther Alvarez, Jayleen Messina, Valeria Rocca, Lazaro Rodriguez
Faculty Advisor: Dr. Anthony McGoron
Company Sponsor: BioTools, Inc.


Walther Alvarez

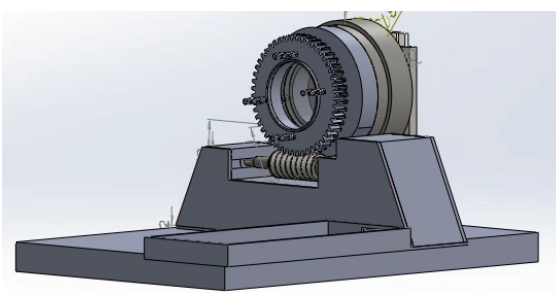

Jayleen Messina


Valeria Rocca


Lazaro Rodriguez

Abstract

FT-IR spectroscopy is commonly used by pharmaceutical and academic companies for drug development. Protein samples and buffers are analyzed loading one sample onto windows and then to the spectrometer. The current modality of only loading one sample for analysis causes the path lengths to vary when multiple samples need to be analyzed resulting in the data to vary as well. The purpose of this project is to deliver a device that is able to load multiple samples onto the windows used for FT-IR spectroscopy to reduce the path length variability between samples and to increase time efficiency. Windows accommodate about 5-6μL of two samples and a buffer solution; leakage is prevented by an etched groove around the sample loading area. Then, a lock-in-frame with a gear system along with a stepper motor creates an automated motion of the windows and make the samples rotate between each analysis.



BioTools

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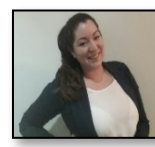
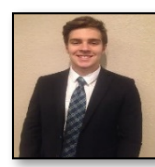
Modeling Adhesion Performance of Transdermal Systems

Team 2: Samuela Lubin, Alexander Santos, Karina Alonso, Austen Elms
Faculty Advisor: Dr. Sharan Ramaswamy
Company Sponsor: AVEVA Drug Delivery Systems


Samuela Lubin

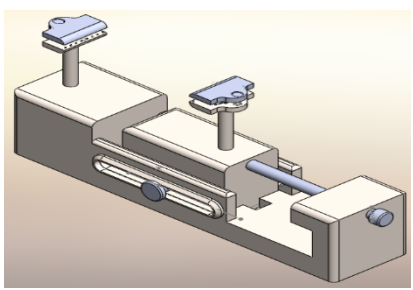

Alexander Santos


Karina Alonso


Austen Elms

Abstract

Transdermal drug delivery methods utilize adhesive patches to allow for extended-release drug delivery. The adhesive of the transdermal drug delivery system is critical to the safety and efficiency of the product. Currently the sponsor tests the adhesive performance of their patches through a 180 and 90 degree peel test as its adhered to a flat surface of metal. The test lacks in simulating the mechanical stresses and dynamic conditions endured when a patch is attached to a patient. The purpose of our project is to precondition the sample to fatigue through cyclic tensile and compressive stresses. It employs a substrate with mechanical properties comparable of human skin, interfaced with the medical adhesive, with a modified measuring vise as a fixture and rotary motor to give motion effectively simulating up to a week's worth of moderate activity and thus stretch.



AVEVA Drug Delivery Systems

FIU Biomedical Engineering Florida International University

Novel stent design for peripheral vascular stenosis

Team 3: Jorge Torres, Teresa Milan, Sebastian Londono, Alex Williams and Amijai Fleischman

Faculty Advisor: Dr. Michael Christie

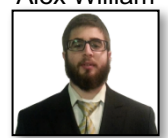
Company Sponsor: BMC Medical Manufacturing

Jorge Torres

Teresa Milan

Sebastian Londono

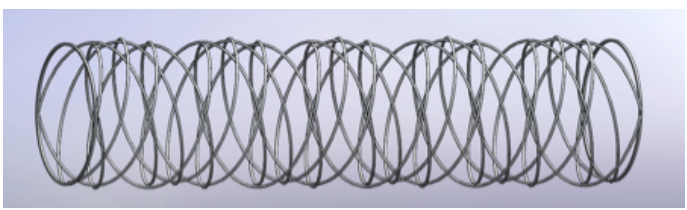
Alex William



Amijai Fleischman

Abstract

Peripheral vascular disease (PVD) is an atherothrombotic condition that inhibits blood flow to the lower limbs. Approximately 750,000 Americans suffer from this disease each year. If untreated, PVD may severely deteriorate a person's quality of life by reducing ambulatory activity; and in worse cases, it may result in amputation of the limb. Balloon angioplasty and stenting are the preferred methods of treating PVD. However, clinical outcomes have shown less than satisfactory results; specifically popliteal artery stenting, with 50-80% of patients developing restenosis and occlusion within 2 years after treatment. The high rates of treatment failure in popliteal artery stenting can be linked to the biomechanical forces experienced by the device in this dynamic environment. While industry leaders have attempted to improve current stent designs as to decrease the frequent incidence of stent fracture in the Popliteal artery; the results are far from promising. The goal of this project is to provide a viable design for a stent whose mechanical properties comply with the forces exerted by the popliteal artery.

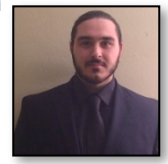


BMC MEDICAL MANUFACTURING

FIU Biomedical Engineering FLORIDA INTERNATIONAL UNIVERSITY

Electric- Free Pump forChemically Induced Oxygenator

Team 4: Arman Hajjar, Santiago Vanegas, Matthew Quinto, Stewd Stephen
Faculty Advisor: Dr. Anuradha Godavarty
Company Sponsor: Apex Medical Technologies Inc.



Arman Hajjar

Santiago Vanegas

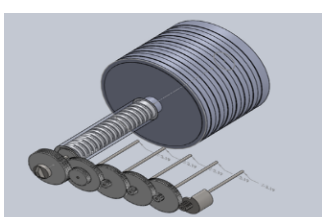
Matthew Quinto

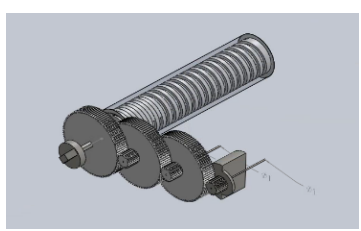
Stewd Stephen

Abstract

The purpose of this project is to design an oxygen generation device for the intent of providing a recommended dose of 6 liters per minute of oxygen for at least 15 minutes. The reason for this, is to avoid the use of compressed oxygen tanks which are a potential danger around open ignition sources. The device is designed to allow two chemicals to react with one another and create oxygen as a byproduct.

One of the main objectives was to create a steady flow rate of one liquid chemical to the other chemical without the use of electricity such as pumps or motors. This was achieved by engineering a mechanical spring powered pump designed to pump the chemical at a steady rate. The second objective was to run a thermal analysis of the reactor using SolidWorks to verify that the reactor material does not deform under extreme temperature gradients caused by the chemical reaction inside.





APEX MEDICAL TECHNOLOGIES, INC.

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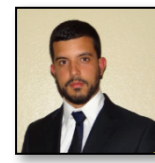
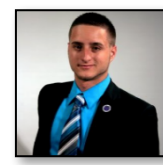
Pressure Map Sensor Device For Syntheon Knot Tyer Mechanism

Team 5: Armando Hernandez, Khiem Nguyen, Josue Santana, Maria Vallejo
Faculty Advisor: Dr. Anthony McGoron
Company Sponsor: Syntheon Cardiology, LLC



Armando Hernandez



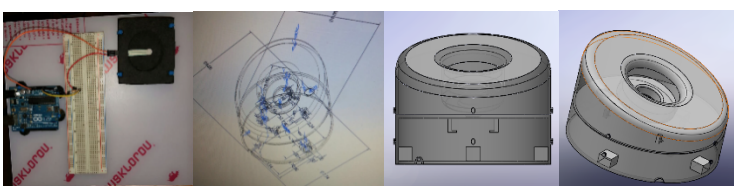
Josue Santana

Khiem Nguyen

Maria Vallejo

Abstract

There is a total of 90,000 aortic valve replacements performed in the United States yearly. Among these, about 25% have a clinical occurrence of para-valvular leak (PVL), and 5% are considered clinically significant. Currently, there are 4,734 active cardiothoracic surgeons in the U.S.; Syntheon LLC. goal is to market a device that attempts to improve technical factors such as suture knot pressures for these surgeons. Our project encompasses a device that serves as tool for Syntheon LLC., demonstrating that their device can apply simultaneous and consistent pressures across each suture. The final output of this project will be a reusable device, which is used to simultaneously measure pressure at different suture points and display its recordings on a pressure map. This device will also be enclosed in a housing that is aesthetically pleasing to users, while simplifying the replacement of individual sensors.



SYNTHEON

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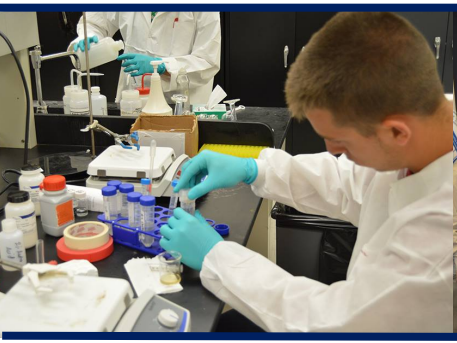

The Department of Biomedical Engineering thanks the engineers and managers of the sponsoring companies as well as our clinical sponsors for offering the Senior Design projects and for their continued student guidance and support.

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