TE CAPSTONE COURSE PROJECTS

Formerly Integrated Product Development (IPD) Program

The Lehigh University TE Capstone project teams work with industry partners and local or student entrepreneurs on real-world, multidisciplinary projects requiring prototypes and business models.
STUDENTS FROM ALL UNDERGRADUATE MAJORS ARE WELCOME
TE Capstone students are typically juniors or seniors majoring in bioengineering, product design, mechanical engineering, supply chain management, marketing, finance and many other disciplines. However, there is no such thing as a typical TE Capstone student. Some of TE Capstone’s most successful students have been those with diverse academic interests such as a theater, history, bioengineering or international relations minor.

Current TE Capstone Stats
The TE capstone program was piloted in 1996 and in 2016 we celebrated our 20th anniversary of providing our students with real-world experiences designed to help them hit the ground running at their first job. Over the past 20 years, our popularity of TE Capstone has grown. Now each year we have over 200 students from all three undergraduate colleges working in over 30 teams of students. Each year these TE Capstone teams work on over 20 sponsored projects that come from established companies, local startups and student startups.

TE Capstone Alums are Creating a Legacy of Mentoring
As former TE Capstone students make their way into leadership positions at relevant companies, they often wish to create a relationship between their company and the program that was instrumental in defining their professional conduct and character. By coming full circle, former TE Capstone students bring with them a wealth of experience and valuable input unique to someone who has participated in the Integrated Product Development process from multiple perspectives. We encourage our TE capstone alum to get involved with mentoring the next generation of Lehigh students.
2017 Team Advisors

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Dr. John Ochs, Director
Aesculap continues to contribute to medical advancements from the perspective of the healthcare professional; and the patient – through innovation, efficiency and sustainability. As an independent, family-owned business, Aesculap embraces the opportunities presented by the global marketplace. Aesculap is currently researching ways to improve the efficiency of operating room procedures. In particular, common surgical procedures, such as removing damaged and degraded spinal discs, have been relatively unchanged since their inception. This procedure is a critical step in spinal fusion surgeries, which remain one of the most common surgical treatments performed in the USA today. It is Aesculap’s goal to quicken this procedure so that the patient spends less time in the operating room, and the surgeon spends more time helping others.

The goal of this capstone project is to research, design, and fabricate a functional prototype of disc space removal instrument. The reach goal is to test this prototype in a lab setting.

Victor Nunez & Chris Good
Company Mentor
Jon Akers
Team Advisor
Christian Davis
Peer Mentor

Aesculap team 1
Haejin Bae ’17 - BENG
Kenneth De Avila ’17 - BENG
Evan Eckersley ’17 - BENG
Alyson Frick ’18 - BENG
Santan Huck ’18 - MAT
Divya Patel ’18 - BENG
Stefan Petreski ’17 - SCM

Aesculap team 2
Hannah Chalk ’18 - BENG
Amanda Devine ’18 - BENG
Coleman Hauber ’18 - MAT
Caroline Kaufman ’18 - BENG
John Mannherz ’18 - ME
Angel Rollo ’18 - BENG
Christian Schmidt ’18 - MAT
Over the past several decades, an increasing number of pharmaceuticals have been produced using biological systems (i.e. cells). There are currently more than 900 medicines and vaccines in development that are produced by biological processes to treat over 100 diseases. Among the most commonly used cell types are Chinese Hamster Ovary, or "CHO", cells, which are often used to make proteins that are monoclonal antibodies (MAbs). In fact, over one-third of the biologics in development are MAbs. Given the number of MAbs on the market and in development, there has been a trend toward standardizing the manufacturing process, i.e. platform processing. Additionally, as patents are expiring on many older products, biosimilars, which are generic versions of biologics, are emerging in the marketplace. Currently, four biosimilar products have been approved in the US and over twenty have been approved in Europe. Regardless of whether a company makes patented products or biosimilars, it is essential to produce the highest quality product that meets regulatory standards and minimizes capital and operating expenses.

The goal of this capstone project is to design a process and facility for cell culture operations for the manufacture of drug substance for three biosimilar MAb products (A, B, and C) intended for commercial supply. The demand is 500 kg/yr of drug substance for Products A and B. The demand is 800 kg/yr of drug substance for Product C. The design and optimization of the process will be performed using the simulation program SuperPro.
INTEGRATED GUARD FOR DISTAL CONNECTOR

B. Braun Medical Inc. (B.Braun) manufactures a great variety of IV Administration Sets and Extension Sets, used with many varieties of IV pumps, to an international marketplace. Medical IV Sets used for performing intravenous therapy are comprised of an assembly of multiple components. The Distal Connector is one of these components and allows for connecting the IV Set to other devices. This connection is accomplished by mating the male luer feature of the Distal Connector to the female luer feature of a mating device. Prior to connection the Distal Connector male luer feature is protected against physical damage, dirt and touch contamination with bacteria by a separate removable guard. When no longer needed, this guard is discarded by the caregiver either into a designated recycling container, general trash or becomes unwanted floor debris in a hospital or home health care setting. The task of disposing of the guard, whether done correctly or incorrectly, detracts from the caregiver’s time spent providing quality care to the patient.

The goal of this capstone project is to develop a new integrated IV guard to improve patient outcomes, reduce infection, be environmentally responsible, and improve the experience for the end user.
STRATEGIES FOR BIOFILM PREVENTION

Biofilms are aggregates of microorganisms that adhere to one another as well as surfaces. They are ubiquitous and will form on practically any surface in a non-sterile aqueous environment. Several advances in materials science have been introduced to help combat household and industrial biofilms, including “scum-resistant” shower glass, biofilm resistant polymers, and other inventions. Regardless, biofilms and the microorganisms that inhabit them lead to complications in the materials, biomedical, defense, environmental, and food industries (among many others).

The goal of this capstone project is to develop a material that resists biofilm growth for a short period of time under laminar flow conditions. The solution can be a coating or other material advance. As an alternative, or in addition to, the team can develop testing strategies and/or devices that can be used to monitor biofilm growth and development. The end product will be incorporated into an environmental testing product, however, the advances made should be translatable to other industries.

Biofilm team
Nadim Ammari ’18 - BENG
Taj Blount-Oden ’18 - ME
Maia Butterfield ’18 - MAT
Tatyana Keshanech ’18 - ME
Evan Pentz ’18 - MAT
Preom Sarkar ’18 - BENG
Kelly Seims ’18 - BENG

Sabrina Jedlicka
Company Mentor
Lauren Purdom
Team Advisor
Kelly O’Neill
Peer Mentor
POROUS CAPTURE MEMBRANE REDESIGN

Viral load tests are imperative for effective HIV treatment monitoring. Currently, laboratory-based viral load tests are too expensive, are too time-intensive, and require too much infrastructure to be accessible in resource-limited settings, where a majority of people living with HIV reside. Approaches to creating point-of-care viral load tests have revolved around miniaturizing lab-based tests, but this technology remains too expensive. Cyclic Solutions utilizes microfluidics and electrochemistry for the capture and quantification of whole HIV on-chip. This approach reduces the need for expensive equipment and has the potential to increase access to viral load tests globally.

The Porous Team is currently working on refining the composition of the binary suspension used for membrane manufacture so that it can be used in R2R processing. Once refined the team plans to complete a prototype of an R2R manufactured membrane. Cyclic Solutions proposes that a continuation of the Porous Team would focus specifically on the refinement and understanding of R2R processing and work to identify possible manufacturing partners.

Porous team

Lauren Anderson ’18 - BENG
Tenzin Dadon ’18 - BENG
Frank Daniels ’18 - BENG
Kyle Kirk ’18 - ME
Christopher Mascetti ’18 - MAT
Brian Pezzuti ’18 - BENG
Juan Shiraishi ’18 - MAT
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The Systems Development Team has worked to address two major challenges over the past two semesters: reagent delivery to the porous capture membrane, and potentiostat miniaturization. A continuation of the Systems Development Team would focus on continued testing of the miniaturized potentiostat (CheapStat) and possible testing parameter program refinement to achieve desired baseline readings. In conjunction with CheapStat development, the team would continue to refine/evaluate and test the valve design that the current team has prototyped, which allows for reagent segregation and ordered delivery to the capture membrane. In addition to these two aspects, a continuation of the project would give the new team the opportunity to address other overall system design issues. Given the current team’s prioritization of project needs, challenges such as the human-machine-interface (HMI) and overall system design were not addressed. Continuing the theme of concurrent engineering that Cyclic Solutions has encouraged, we would challenge the Systems and Membrane team to work together to push both independent and dependent system development.
NOVEL BALANCE DEVICE

A recent study showed that 5% of American children, ages 5-17, reported having chronic mobility problems, resulting from a variety of causes, including diseases, disorders, or physical trauma. Market research conducted by the DEBUT team indicated that a majority of children with mobility issues use walkers as their main mobility assistive device, and the most prevalent challenge faced by children when using walkers is overcoming architectural barriers such as curbs, sidewalks, door frames, stairs, and inclines, among others.

The goal of this capstone project is to focus primarily on children requiring assistive walking devices, who struggle with architectural features and terrain differences that limit their access and mobility. The DEBUT team aims to create a product that improves their ability to safely and effectively navigate a variety of architectural barriers, thereby improving their walking experience and quality of life.

Bill Best
Company Mentor
Sue Perry
Team Advisor
Patrick Zager
Peer Mentor

Debut team
Jayne Guthorn ’18 - BENG
Yelena Kudryashova ’18 - ME
Tamara Lalovic ’18 - BENG
Matthew Lucente ’18 - ME
Jacob Nemeth ’18 - ME
Josh Nierer ’18 - EVIR
Adam Rosenwasser ’18 - ME
ISOLETTE ODOR

Draeger is a global company covering many markets and industries, from firefighting and environmental equipment to medical devices. Here at Lehigh the TE students worked with an Isolette, an infant incubator, to diagnose a unique engineering challenge. Throughout the process the students broadened their engineering, entrepreneurial, and business knowledge while accomplishing the task at hand.

Draeger is a 127 year old company with expertise and market leadership in Anesthesia and Respiratory Care with Sales in excess of 2.7 Billion Euros per year. Draeger’s expertise with breathing and monitoring extends into the safety related industry too.

Dan Marshall
Company Mentor

Matt Bilsky
Team Advisor

Sharon Sangermano
Peer Mentor

The Isolette is sold worldwide and have been in the market for 70 years. The TE Capstone team is solving a real world engineering challenge that will ensure continued use with deeply satisfied customers.
3D PRINTED COMPONENTS FOR AERO TEST RIG

The DRESSER-RAND business, part of Siemens Power & Gas, is one of the world’s leading suppliers of high performance centrifugal compressors for the oil and gas industry. DRESSER-RAND’s goal is to provide our clients with turbomachines that minimize power consumption while maximizing throughput. Despite advances in analytical tools, DRESSER-RAND continues to depend heavily on our aero test rigs to validate novel designs and configurations. However, the cost of rig parts can be a major concern. Therefore, DRESSER-RAND continually seeks ways to apply advanced manufacturing processes and alternate materials to reduce the costs of our rig test programs. Based on preliminary studies, 3-D printing of non-metallic components could provide significant savings if the parts could have sufficient strength to survive under test rig conditions.

The goal of this capstone project is to determine: (a) what materials can be used to form either stationary or rotating aerodynamic components in the test rig; (b) if additional structural members (i.e., wire mesh, carbon fibers, etc.) can be added to provide increased strength; (c) develop the printing procedures that must be applied; and (d) assemble the cost estimates for select rig components.

3D print team 1
Jeremy Ahn ’18 - ME
Jennie-Rose Barrella ’18 - ME
Johnathan Fitz ’18 - SCM
Alexandra Mangino ’18 - SCM
Thomas Murray ’18 - ME
Gannon Reichert ’18 - MAT

3D print team 2
Yuan Gao ’18 - ME
Christopher O’Byrne ’18 - ME
Ryan Rothenberger ’18 - ME
Noah Saltzman ’18 - ME
Lucas Van Dyke ’18 - ME
Buang Zhang ’18 - MAT
The DRESSER-RAND business, part of Siemens Power & Gas, is one of the world’s leading suppliers of high performance centrifugal compressors for the oil and gas industry. DRESSER-RAND’s goal is to provide our clients with turbomachines that minimize power consumption while maximizing throughput. Despite advances in analytical tools, DRESSER-RAND continues to depend heavily on our aero test rigs to validate novel designs and configurations. Numerous pressure and temperature probes are installed in rig components to collect critical data that is used to validate the stage performance. It is extremely important that these probes be oriented properly or the data collected could be erroneous and mislead designers on the viability of new designs. The current method of installing probes is prone to error because the instrumentation mechanic must visually assess the setting angle for the probe. The probe might also rotate when it is being secured in place, adding further uncertainty into the positioning process.

The goal of this capstone project is to develop a tool or set of tools that can be used by the instrumentation mechanic to ensure that the probes are set at the proper angle and that the probe remains stationary while it is secured in place.

Positioning team
Matthew Ciolino ’18 - ME
Joseph Cline ’18 - MAT
Caitlyn Cole ’18 - ME
Magdalena Fannick ’18 - ME
Thomas Farihna ’18 - MAT
William Johns ’18 - ME
WIND TUNNEL FOR PROBE VALIDATION

The DRESSER-RAND business, part of Siemens Power & Gas, is one of the world’s leading suppliers of high performance centrifugal compressors for the oil and gas industry. DRESSER-RAND’s goal is to provide our clients with turbomachines that minimize power consumption while maximizing throughput. Despite advances in analytical tools, DRESSER-RAND continues to depend heavily on our aero test rigs to validate novel designs and configurations. Many of the probes used to collect data from the test rig are used to determine gas flow angles in critical components of the stage. These flow angles are compared against predicted values to confirm the accuracy of DRESSER-RAND prediction software. Occasionally, these probes get damaged or fouled, which causes them to provide erroneous measurements. It is possible to have these probes checked by a 3rd party but this adds significant cost to the test program.

The goal of this capstone project is to develop a small wind tunnel that can be used to validate the flow angles provided by the various probes used in the aero test rig. The test rig must be capable of achieving 0.75 Mach number based on the gas velocity in air.

Wind Tunnel team 1
Evan Baitch ’18 - ME
Mark Herndon ’18 - ME
Dylan Milonas ’18 - SCM
Dustin Nguyen ’18 - ME
Nicholas Schepis ’18 - ME
Sen Yang ’18 - ME

Wind Tunnel team 2
Daniel Altman ’18 - ME
Andres Binotto ’18 - ME
Daniel Dunham ’18 - ME
Jennifer Dwyer ’18 - ME
Xin Han ’18 - ME
Claudia Kolanovic ’18 - ME
EcoTech Marine continues to revolutionize the way people think about marine technology. A great deal of international attention focuses on sustaining the health of the world’s marine environments, motivated by environmental protection, food production and economic viability of developing nations, and recreation. Marine water chemistry is considered relatively static with regards to ionic balances, but increasingly, these balances are at risk. Many marine ecosystems in nature have disruption of pH and other ionic species that can lead to organism demise. The act of understanding these dynamics can lead to long-term environmental protection solutions. Routine monitoring of ocean chemistry could provide data that could be correlated to species diversity, animal health, and overall chemical trends in the ocean environment.

SCRAM, a subsidiary of EcoTech Marine, is interested in using laser technology to manufacture a high-intensity and flexible off-road light for recreational and racing use. Laser-based headlights are now used in high-end cars from BMW and Audi. Due to more coherent light, laser technology facilitates better visibility further away from the car than is possible from traditional technologies such as incandescent, LED, or HID lights. This capstone project will include the market research and design of the product line from the ground up.

SCRAM OFF-ROAD VEHICLE LASER LIGHT

Patrick Clasen
Company Mentor

Sabrina Jedlicka
Team Advisor

Kumar Swaget
Peer Mentor

SCRAM OFF-ROAD VEHICLE LASER LIGHT

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Ecotech team
Leann Corwin ‘18 - ME
Haley Derauf ‘18 - ME
Sarah Garberg ‘18 - ME
John Larson ‘17 - SCM
Manuel Mendez ‘18 - ME
Yuchuan Wang ‘18 - ME
Jingyang Xing ‘18 - ME
HYBRID BALLISTIC HELMET

Gentex is a global provider and partner of choice for personal and situational awareness products, systems, and platforms. Gentex’s FAST Carbon and FAST PC helmets are designed, engineered, and manufactured to protect and allow wearers to successfully perform their duties. Blunt impact protective helmets have always and will continue to be in an arms race to find the lowest weight design that performs to the highest standards. The industry is moving towards advanced fiber reinforced plastics solutions that are lighter, stiffer and conversely much more expensive. However unreinforced fibers, while more cost effective are not stiff enough to provide the same level of performance. Gentex believes there is a solution that can equal or better the performance of a carbon fiber shell whilst matching or beating the cost of the PC shell.

The goal of this capstone project is to investigate new materials to replace the current structural shell on the FAST Blunt Impact helmets.

Russell Caspe
Company Mentor

Evan Gaj
Team 1 Advisor

Jordan Inacio
Team 2 Advisor

Amanda Ruschel
Peer Mentor

Gentex team 1
William Bickel ’18 - ME
John Luczkovich ’18 - ME
Samuel Minick ’18 - BENG
Nicole Pellecchi ’18 - BENG
Ryan Vargo ’18 - ME
Myrna Yehia ’18 - BENG

Gentex team 2
Timothy Choe ’18 - BENG
Gabriel Donald ’18 - ME
Gavin Hatfield ’18 - ME
Jenna Huynh ’18 - MAT
Dylan Karchere-Sun ’18 - ME
Robert Murray ’17 - ME
Rami Nasrallah ’18 - ME
SPINDLE LOCK FOR RATCHETS

Ingersoll Rand is a manufacturer of diversified industrial products that support productivity – air compressors, air treatment equipment, tools, pumps, winches and hoists. The Power Tools Business Unit engineering team in Annandale, New Jersey designs premium tools for vehicle maintenance and industrial technicians all over the world. Mechanics use ratchets to remove and install fasteners in very tight access locations. These tools have extremely low head height for great access and the mechanism locks up the output spindle so the user can manually use it like a standard breaker bar wrench. There are several downsides to this type of tool: it produces a torque reaction, its free-speed rpm is low, the directional control is on the head and it has a low limit to torque at around 60 ft-lbs. Ingersoll Rand created two new products to remedy some of the downsides of ratchet products in the last few years. These products are meant to do the same work as a ratchet but they are impacts wrenches. The head heights is not as low as a ratchet, but impacts do not have any torque reaction, the controls are back by the hands, and they are able to make much more torque than a ratchet (180 ft-lbs), and have a very high free-speed. The downside is that these mechanisms do not have the ability in their current form to lock the spindle so the user can have the ability to use the wrench manually.

The goal of this capstone project is to create a spindle lock feature on the 2015 Max “Hammerhead” Pneumatic Right Angle Impact Wrench.

Kevin Heinrichs  
Company Mentor

Rishit Arora  
Team Advisor

Arthur Hedderly-Smith  
Peer Mentor

Ingersoll Rand team 2

Bailey Brown ’18 - ME  
Anton Chrysanthopoulos ’18 - MAT  
Brian McCabe ’18 - ME  
Jason Sadler ’18 - ME  
Xinyue Shi ’18 - ME  
Joshua Toth ’18 - ME  
James Waring ’18 - ME
CR CLOSURE 2.0

Johnson & Johnson (J&J) embraces research and science – bringing innovative ideas, products and services to advance health and well-being of people. Employees of the Johnson & Johnson Family of Companies work with partners in health care to touch lives of over a billion people every day, throughout the world. J&J has more than 275 operating companies in more than 60 countries employing approximately 125,000 employees. The worldwide headquarters is in New Brunswick, New Jersey. The consumer sector of J&J offers a broad range of products to consumers globally in the baby care, skin care, oral care and women’s health care fields as well as over-the-counter pharmaceutical products. This includes brands like Johnson’s, Neutrogena, Aveeno, Band-Aid, Neosporine, Listerine, Tylenol, Motrin and many more.

Child resistant packaging, or CR Closures, are specially designed closures to prevent a child’s access to dangerous items, therefore reducing the risk of ingestion. The goal of this capstone project is to develop a new CR Closure.

Rob Fusi
Company Mentor
Lauren Purdom
Team 1 Advisor
Jordan Inacio
Team 2 Advisor
Brandon Short
Peer Mentor

J&J team 1
Stephanie Amorim ‘17 - SCM
Andrew Brown ‘18 - ME
Carlos Chavez ‘18 - ME
Zhenhui Chen ‘18 - MAT
Nicholas Hoffman ‘18 - ME
Michael Lessel ‘18 - ME
Vincent Rienzi ‘18 - MAT

J&J team 2
Zachariah Bucklin ‘17 - SCM
Samuel Joynson ‘18 - ME
Juliana Malachin ‘18 - MAT
Timothy O’Hara ‘18 - SCM
Michael Roach ‘17 - MAT
Kelly Seims ‘17 - BENG
Mark Sensenig ‘18 - ME
According to Pet Humanization: The Trend and Its Strategic Impact on Global Pet Care Markets, "Pet owners are increasingly treating their cats, dogs and even small mammals like members of their family. The opportunity to commercialize this trend into a vast range of goods and services – from dog beer to cat counseling, from pet weddings to 'social pet networking' – is staggering for the company that can position themselves in such a way to gain credibility among this growing demographic." Combining the trend of pet humanization with that of social media usage leaves an untapped market within the $69 billion dollar (recession proof) pet industry.

The goal of this capstone project is to create a device that coaxes a pet into taking a picture of itself. The pet owner could upload these pictures to the pet’s social media accounts. Many products currently exist that allow a pet owner to take pictures of their pets, but nothing exists that allows a pet to take a picture of itself.

Rufftech team

Chris Bianco ’18 - ME
Ryan Bonshak ’18 - ME
Jiaye Chen ’18 - ME
Alison Cohen ’18 - SCM
Griffin Green ’18 - ME
Ryan Hunt ’18 - ME
Emily McKeown ’18 - SCM
Operating out of Bethlehem, Pennsylvania, Soltech Solutions is a young startup that develops green and energy efficient products to enhance your daily life. The Aspect grow light provides an effective way to grow any plant indoors by providing a unique spectrum of light required for photosynthesis. By growing plants under a grow light, the user is no longer restricted by the amount of natural light the plant receives. With a grow light, not only can plants grow anywhere, but users can set light cycles that manipulate plant development. Unlike other grow lights on the market, the Aspect grow light is primarily used by non-professional growers who utilize plants as a part of a room's décor. This new group of growers may be unfamiliar with basic plant lighting needs and unable to dedicate enough time to learn their plants optimal lighting cycles.

The goal of this capstone project is to design and prototype a user friendly method for controlling the light cycles of a grow light system.

Paul Hodges  
Company Mentor

Sam Bernstein  
Team Advisor

Nick Mietkowski  
Peer Mentor

Soltech Team  
John ’Cal’ Coffman ’18 - ME  
James Davey ’18 - ME  
John Galvis ’18 - ME  
Prarthna Johri ’18 - MKTG  
Lanisha Otuonye ’18 - SCM  
Kendall Savage ’17 - SCM  
Doyle Tuvesson ’18 - ME
While many aspects of the bowling industry have adapted to maximize the customer experience, rental shoes have remained unchanged. Sowl is an attachable bowling sole that improves the end-user bowling experience by allowing them the comfort and sanitation of bowling in their own shoes. For bowling alleys, the target customer, Sowl provides a durable and cost-effective alternative to rental shoes. Sowl consists of three components: a thermoplastic frame, a leather sole, and an adhesive.

The capstone team is tasked with exploring different manufacturing methods for the product at various scales of production. Manufacturing methods will need to be validated to ensure product quality is maintained. This will involve developing testing protocols for relevant material properties. Ensuring product performance through testing will be necessary to validate the durability of the product, which is one of the key value propositions. Additionally, manufacturing methods will need to be analyzed from a financial perspective. The ultimate goal is to determine which manufacturing methods yield the optimal returns at various scales of production.

Sowl team
Casey Breuer ’18 - ME
Michael Brill ’18 - MAT
John Chou ’18 - ME
Chris Dallao ’18 - SCM
Zoe Rosenberg ’18 - MAT
Ryan Stiefel ’18 - ME
Matt Unangst ’18 - SCM
BLOOD INVENTORY

St. Luke’s University Health Network is a non-profit, regional, clinically integrated, and nationally recognized health system providing services at 7 hospitals and nearly 300 patient and support facilities – in nine counties in Pennsylvania and New Jersey. We have over 62,000 annual in-patient admissions and observations and nearly 250,000 annual ER visits.

Blood and blood-products are critical for emergencies to keep patients alive. Blood, and its derivatives, are required for multiple clinical needs – often emergent and unpredictable. We manage a dynamic inventory of blood products within our hospital locations. Blood is a regulated and perishable product, which needs to maintain strict controls and oversight. Over or under-stocked facilities can result in the lack of product required for a patient, or excess inventory, which may be discarded due to expiration.

This project will support initiatives around understanding our current blood inventory management distribution, map out processes and inventory hand-offs, cold-channel requirements, and technologies required to maintain and manage inventory. The capstone team will be working with the Network Director of Laboratory, who is responsible for laboratory, pathology, and blood bank services. The goal will be to identify processes and technologies to streamline blood bank services and identify opportunities to optimize processes.
PHARMACY

St. Luke’s University Health Network is a non-profit, regional, clinically integrated, and nationally recognized health system providing services at 7 hospitals and nearly 300 patient and support facilities – in nine counties in Pennsylvania and New Jersey. We have over 62,000 annual in-patient admissions and observations and nearly 250,000 annual ER visits.

The services provided by the Pharmacy Department are critical to ensure our patients receive proper Pharmaceutical management. The Pharmacy department dispense medications ranging from oral solids all the way to Intervenes Chemotherapy. St Luke’s also operates retail pharmacies, that provide discharge prescriptions and subsequent refills at three hospital facilities.

The goal of this project is to support initiatives around understanding pharmacy utilization, map out processes and inventory hand-offs, cold-channel requirements, and identify opportunities for value-creation (especially within retail pharmacy). The capstone team will be working with the Network Directory of Pharmacy, who is responsible for all pharmacy operations across in- and out-patient settings. The goal will be to understand the nuances of in-house pharmaceutical supply chain, provide recommendations and insights around improving operations with process-changes and technologies, and identify additional opportunities to optimize processes or offerings.

Patrick Ferguson & Donna Yeaw
Company Mentor

Brianna Lohman
Team Advisor

Julianna Kerwood
Peer Mentor

Pharmacy team
Adrien Antoinette ’18 - ME
Caitlyn Backer ’18 - ME
Carolyn Eichhorn ’18 - SCM
Paige Howes ’18 - SCM
Erica Kier ’18 - BENG
Mathew Lucas ’18 - BENG
Phoebe Wager ’18 - BENG
LAB OUTREACH

St. Luke’s University Health Network (SLUHN) is a non-profit, regional, clinically integrated, and nationally recognized health system providing services at 7 hospitals and nearly 300 patient and support facilities – in nine counties in Pennsylvania and New Jersey. We have over 62,000 annual in-patient admissions and observations and nearly 250,000 annual ER visits.

SLUHN’s Laboratory Outreach Services has nearly 40 Patient Service Centers (PSCs) across 8 counties in Eastern PA and NJ with over 80 phlebotomists and support staff. It serves nearly over a quarter million patients a year performing approximately 1.3M outpatient tests. A critical extension of the PSCs is St. Luke’s LabLink. LabLink is a full service customer service center offering assistance to physicians, offices and patients. The LabLink team handles nearly 60k calls a year and is responsible for all Laboratory Outreach problem resolution and capturing qualitative and quantitative feedback for departmental process improvement.

The goal of this project is to find new and innovative ways to improve processes and workflows to increase the Call Center efficiency while improving the customer experience and management’s understanding of day-to-day performance. The capstone team is working with the Director of Lab Outreach and the Manager of LabLink. We are hoping that the team will be able to provide us a vision, process engineering improvement and options for increasing the efficiency and availability of our services.

Diana Laquinta
Company Mentor

Paul Myerson
Team Advisor

Kiana Wright
Peer Mentor

Lab Outreach team
Esther Binder ’18 - ME
James Chappell ’18 - ME
Syed Mohammed Ibrahim
Hashmi ’18 - ME
David Kauffman ’18 - ME
Lia Sagiv ’18 - SCM
Anthony Trapani ’17 - SCM
DEVELOPING A NATIONAL POLLEN MONITORING NETWORK

The effect of pollen on allergic conditions (e.g. asthma and allergies) have been increasing in response to climate change (e.g. increased temperatures, CO₂ levels). The adverse effects of air pollution and pollen exposures increases the intensity, frequency, and duration of clinical allergic/asthmatic symptoms. The U.S. prevalence of allergies has increased from 10% to 30% from 1970 to 2000 and affects approximately 40% of children while ~25 million people in the U.S. currently have asthma, and the numbers continue to increase.

The goal of the StarX capstone project is to develop an automated pollen detection device (APD) called PollenEyes™. This real-time pollen counter will gather the data for an online database PollenUnderground™. The pollen forecasting, analysis, and reporting service Acupollen™ then distributes the information to health departments, media outlets, and the general public through a website and social media links.

Lenny Bielory
Company Mentor
Matt Bilsky
Team Advisor
Sharon Sangermano
Peer Mentor

Starx team
Nicholas Barker '18 - ME
Alan Bebout '19 - ME
Maria Castro '18 - MAT
Brittany Collins '18 - ME
Liam Dow '18 - BENG
Gustavo Grinstein '18 - ME
Derek Tannoia '18 - BENG
FOCAL DEFECT PLUGS

Stryker Orthopaedics, located in Mahwah, New Jersey, is a leading manufacturer of joint replacement systems. One area where Stryker concentrates its product development is in early intervention knee systems. Focal defects are defects or lesions in the articular cartilage, often times on the medial condyle of the knee, due to any inflammation, injury, or trauma causing a partial or full thickness cartilage deficiency in a well-defined area. Focal defect plugs are implantable devices which are used to surgically replace damaged cartilage as an early intervention alternative to total knee replacement.

With advancements in additive manufacturing (i.e. 3D printing) and robotic assisted surgery, the objective of the 2017 capstone project is to design an implant(s) that leverages these two technologies to treat focal defects.

Kenneth Pascale
Company Mentor

Sabrina Jedlicka
Team Advisor

Cassie Christman
Peer Mentor

Focal Defect team

Erin Akins ’18 - BENG
Sarah Alva ’18 - BENG
Daniella Fodera ’18 - BENG
Adam Kunkel ’18 - ME
Yasmina Sirgi ’18 - BENG
Ramzi Yanez ’18 - BENG
Michael Zunno ’18 - BENG
PATELLAR TENDON REATTACHMENT TO PROXIMAL TIBIA REPLACEMENT

Stryker Orthopaedics, located in Mahwah, New Jersey, is a leading manufacturer of joint replacement systems. A proximal tibia replacement is used when a patient undergoes surgery to remove a tumor from their tibia or in the case of a knee revision surgery where there is a large amount of bone loss and instability. To restore the function of the knee, the surgeon must reattach the patellar tendon to proximal tibia replacement. The tendon reattachment must be strong enough to withstand the forces exerted by the quadriceps muscles during daily active use. The goal of the 2017 capstone project is to design a mechanism for patellar tendon reattachment to a proximal tibia replacement that utilizes additive manufacturing to enable soft-tissue ingrowth for long-term fixation. This biological fixation means should also be supplemented with a mechanical anchor for initial tendon fixation.

Tibia Replacement team
Bonaire Berry ’18 - BENG
Ian McCartney ’18 - ME
Burlan Sizemore ’18 - ME
Amanda Stratton ’18 - BENG
Adrian Vitello ’18 - BENG
Mae Williams ’18 - BENG
SMART HOME APPLICATIONS FOR THE ELDERLY AND DISABLED

Tom Keeler
Company Mentor

Lauren Purdom
Team Advisor

Micah Tennant
Peer Mentor

Thomas Keeler ’79 recently moved his elderly mother into an independent care facility and noticed the need for apps to assist her with her daily living needs. After searching the market, it was clear that the available technology was either limited or too complicated for an older person to handle. Issues with eyesight, hearing, mobility and strength were not addressed in most cases. He began experimenting with a few items such as a doorbell that was easier for his mom to hear, a simplified TV remote and an adjustable light. He also made a reader out of an old iPhone that magnifies texts as you hover over it. It is obvious that there is a need for devices that are engineered to be slower, larger and simplified for older or disabled people to use.

The goal of this capstone project is to design a system that will assist the elderly and disabled to improve their standard of life. This could be accomplished by combining existing products or technology into one system or by creating something entirely new that meets an unmet need for this demographic. The project will include the full process of bringing an idea to life.

TRK Engineering team

William Anderson ’17 - SCM
Anika Chakravarti ’18 - ME
Matthew Cimera ’18 - ME
Benjamin Hamblett ’18 - BENG
Hayden Hosto ’19 - SCM
Chandler Kline ’18 - BENG
Ross Miller ’18 - ME
Majors and Minors Represented in 2017 TE Capstone Teams

BENG: Bioengineering
BUS: Business
DES: Design
EVIR: Earth and Environmental Science
MAT: Material Sciences and Engineering
MKTG: Marketing
ME: Mechanical Engineering
PROD DES: Product Design
SCM: Supply Chain Management