Capstone senior design projects from the biomedical, biological, electrical, engineering technology and industrial distribution, computer science, industrial and systems, and mechanical engineering departments are showcased in the annual Engineering Project Showcase.

Magda Lagoudas, Executive Director, Industry and Nonprofit Partnerships, Instructional Associate Professor, Engineering Academic and Student Affairs, m-lagoudas@tamu.edu, 979.862.8321

For more information, visit: 2018 EPS video (tx.ag/2018EPSVideo) | 2018 EPS booklet (tx.ag/2018EPSBook)
Senior Capstone Design courses provide engineering students in their senior year to collaborate on team projects sponsored by industry and apply their knowledge and skills in developing a design solution that meets the design requirements of the sponsor. Projects may include conceptual design and analysis studies and prototypes.

The Texas A&M University College of Engineering is one of the largest engineering schools in the country, ranking second in undergraduate enrollment and eighth in graduate enrollment by the American Society for Engineering Education (ASEE) in its 2016 survey. Our college consistently ranks among the nation’s top public undergraduate and graduate engineering programs, according to U.S. News & World Report. In 2018, both undergraduate and graduate programs ranked seventh among public institutions in the country.

The Zachry Engineering Education Complex is a 525,000-square-foot modern technology-integrated facility dedicated to undergraduate engineering education. The facility includes the 60,000-square-foot state-of-the-art Fischer Engineering Design Center to support undergraduates in design and prototype development. Students have access to fabrication equipment, a parts library, work benches for collaboration and conference rooms. The new facility provides a unique opportunity for industry to collaborate with students on projects.

Texas A&M offers several contractual options to accommodate industry needs for confidentiality, intellectual property and deliverables.
Creativity is accelerated through a combination of imagination, ability, space, tools and materials. It is enhanced by having a place where ideas can be tested, refined and tested again as rapidly as possible. Having the right tools and materials readily available allows students to build amazing creations that expand the realms of possibility. The SuSu and Mark A. Fischer ’72 Engineering Design Center is an open space where engineering students have access to state-of-the-art prototyping tools, equipment, material and support staff. Through partnerships with industry and non-profit sponsors, the center is an environment which concepts become solutions to real-world problems and student teams come together to build new prototypes, acquire new skills and develop new relationships. Students have access to resources such as 7-axis Multi 300 CNC, advanced micro CNC, 3D plastic printers, 3D metal printers, 3D foam cutter, jet edge water, carbon fiber build station, and wire EDM capabilities.

**DEPARTMENTAL CAPSTONE DESIGN WEB PAGES**

Senior capstone design courses vary within majors (1 vs. 2 semesters) and each major has a Senior Capstone Design Faculty Coordinator who will work closely with the sponsor to define a suitable project.

- **AERO** — engineering.tamu.edu/aerospace/academics/capstone/Capstone-Design
- **BAEN** — baen.tamu.edu/academics/undergraduates/capstone
- **BMEN** — engineering.tamu.edu/biomedical/academics/seniordesign/index
- **ECEN** — engineering.tamu.edu/electrical/academics/student-projects/capstone
- **MMET** — engineering.tamu.edu/etid/mmet/capstone-project
- **MEEN** — engineering.tamu.edu/mechanical/academics/capstone-design/index
- **CSCE** — courses.cs.tamu.edu/rgutier/csce482_s16/gallery.htm
- **OCEN** — engineering.tamu.edu/ocean/academics/senior-capstone-design-experience
- **ISEN** — engineering.tamu.edu/industrial/capstone/index
- **CVEN** — engineering.tamu.edu/civil/academics/capstone
- **ESET** — engineering.tamu.edu/etid/eset/capstone-project
**Department of Biological and Agricultural Engineering:** *Water-energy-crop analysis for land management and irrigation (sponsored by South Texas Advancement Resource)*  
The goal of this project is to develop a sustainable agricultural model for a 100-acre plot of land in South Texas, a location that traditionally only grazes cattle. The pasture is in a challenging environment with a low-average annual rainfall rate, variable temperatures and very poor ground water quality. The team has been tasked with determining the best options of crops to grow for profit on the condition of likelihood of success. They will be giving three different options of choices ranging from low to high initial investment. These three options will have different combinations of crops, water sources and energy sources. The sponsor will then be able to decide which system to implement.

**Biomedical Engineering:** *Automated bifurcated antegrade cardioplegia catheter (sponsored by Quest Medical, Inc.)*  
During open-heart surgery, a bifurcated catheter is used to intermittently deliver cardioplegia solution used to facilitate cardiac arrest to the heart and evacuate fluid buildup from the heart. Currently, perfusionists manually control the operations of these two systems, allowing for possible human error and potential diversion of cardioplegia solution away from the heart. A device is presented that will automate the delivery and vent systems to eliminate this possibility through the use of a spring-loaded piston that moves in response to delivery pressure, or lack thereof, to open and close each line as needed. This device will also possess the capability to sense aortic root pressure and will perform all functions in one compact device so as not to occlude the surgeon’s view.

**Computer Science and Engineering:** *CommBo: Modernizing augmentative and alternative communication (sponsored by the Department of Computer Science and Engineering)*  
For every 100,000 people, there are 536 speech-impaired individuals who can benefit from the use of augmentative and alternative communication (AAC) devices. AAC devices currently available are either difficult to adjust or prohibitively expensive to own. We aim to create CommBo, a web-based, speech-generating picture communication board that alleviates the major pain points of AAC users. CommBo offers customizability far beyond that of a physical picture board and leverages machine learning to provide intelligent suggestions. This enables heightened communication that can be brought to any internet-connected device. CommBo is designed for those patients suffering from stroke-induced aphasia, autistic spectrum disorder or any trauma that impacts the person’s ability to communicate effectively.
Electrical and Computer Engineering: Biotronik MRI RF-induced energy loop recorder (sponsored by Biotronik) RF fields can cause interference in active implantable medical devices (AIMD) like pacemakers. The energy loop recorder aims to measure the energy induced by RF fields as a step toward developing reverse transfer functions. It consists of an electronic system that will be miniaturized to fit into an AIMD. By placing the energy loop recorder into the can directly, the need for external testing probes that are also affected by the RF fields is alleviated. This system consists of analog-RF circuitry to condition the signals, a microcontroller for analog/digital conversion and a GUI for post-processing and analytics.

Engineering Technology: Automation layout for Tenaris accessory plant (sponsored by Tenaris) The team was tasked with researching the best available technologies in the market today and proposing an innovative fully automated layout for a Tenaris accessories plant located in Houston, Texas, where the main processes that needed to be addressed and automated are everything from reception, storing, loading/unloading each work piece to and from the CNC machine, pre-inspection, post inspection and final acceptance. The finalization of the project also required a detailed design package and possible preferred vendors to aid in the final layout.

Industrial and Systems Engineering: Efficiency driven by cost performance (sponsored by UPS) During peak demand season (fall holidays), UPS and its competitors hire workers to handle the workload increase. During last year’s peak season, UPS noticed workforce shortages as competitors such as FedEx, Walmart and Amazon acquired most of the available workforce. This prompted UPS to gather prior peak season data to produce a performance vs. cost analysis and identify key efficiency drivers, workforce forecasting and form techniques used to reduce cost across the three service providers in specific U.S. regions. This comparison aims to create a 5-10 percent increase in efficiency for UPS and is based on metrics such as stops per on-road hour, net delivered, stops per car, total stops, driver function time, over-allowed time, and packages and deliveries.

Mechanical Engineering: Remote Control Multivariate Water Analysis Craft (sponsored by Nalco Champion) Nalco Champion helps its customers to effectively use water for different oilfield applications, including the reuse and recycling of water where possible. The water is stored in outdoor holding pits, and water samples are needed to provide insight into the safety and quality of the water. The goal of the project is to design a device that can enable real-time water analysis throughout the holding pit. The device should be able to be remotely moved and positioned over the surface of the water, collect multiple water samples at various depths and assess water quality in order to help customers make faster and more informed decisions regarding water treatment for reuse.
BENEFITS, EXPECTATIONS, TIMELINE AND FEE

BENEFITS TO STUDENTS

- Apply engineering skills to real-world problems
- Apply the engineering design process in solving customer problems
- Gain experience in understanding customer design requirements and develop solutions that meet customer needs
- Gain experience in developing project plans and project milestones
- Gain experience in effective collaboration within teams
- Gain professional experience by interacting with industry professionals
- Gain experience serially presenting progress of projects

BENEFITS TO INDUSTRY

- Get ideas for innovative solutions to existing problems
- Get quality technical work from a team of senior undergraduate students
- Receive prototypes of developed solutions
- Evaluate student team for potential future hires
- Access to engineering faculty
- Raise company awareness within engineering
- Showcase project at the annual Engineering Project Showcase

EXPECTATIONS

Students are expected to work in teams of four to six on industry-sponsored projects and each student is expected to dedicate 10 or more hours per week on the project. For a two-semester project (28 weeks), each student is expected to work about 280 hours on the project (140 hours for a one-semester project). Therefore, a team of four students will contribute more than 1,000 hours on the industry-sponsored project over a nine-month period (September to May), which translates into significant value for the sponsor.

Industry sponsors of senior capstone design projects are expected to have a well-defined project, expected outcomes, and well-defined requirements and constraints. They are encouraged to interact regularly with the student team and provide feedback to ensure that they are pursuing design options of value to the company. Industry sponsor needs for nondisclosure agreements and intellectual property can be handled.

TIMELINE

While most engineering departments offer a two-semester sequence of senior capstone design, there are a few engineering departments that offer a one-semester senior capstone design course. We encourage sponsors to submit senior capstone design projects at least two months before the beginning of the semester. This will ensure faculty have adequate time to review the project and prepare it for the best educational outcomes for students and best value to the sponsor. Sponsors are encouraged to reach out to departmental capstone coordinators to identify and define project scope.

SENIOR CAPSTONE DESIGN FEE

Senior capstone design fees vary by department and range from $5,000 to about $15,000. Most departments offer discounts for multiple sponsored projects.
SPONSORS OF SENIOR CAPSTONE DESIGN PROJECTS AT THE 2018 ENGINEERING PROJECT SHOWCASE

ABOVE UAV
Air Force Research Lab
American University of Beirut
ASHRAE
Bailey Tool and Manufacturing
Baylor Scott & White
Biotronik
BlastMask LLC.
Boeing Company
BP
Bray International
Brazos Valley Center for Independent Living
Brooke Army Medical Center
College Station Urology
CorInnova Inc.
Danfoss Turbocor Compressors Inc.
Dell EMC
DrawWorks, LP
Eagle Sports
Electrical Power Research Institute
Emerson
Engineering World Health Organization
ETAPA and Universidad de Cuenca
Exosphere
Fluor Corporation
General Motors Company
Goodman Manufacturing Company, L.P.
Halliburton
Houston Community ToolBank
IBM
Igloo Products Corporation
INEOS
International Cooling Tower
Just4Water
KBQ
Knowledge Based Systems, Inc.
Lockheed Martin
Los Alamos National Laboratory
Madden’s Market Inc. DBA Mad Taco
Megahertz Technology
Mobility Worldwide, Inc
NASA
NASA/Boeing
NASA-JSC Robotic Systems Technology Branch
NOV Grant Prideco
Pacific Northwest National Laboratory
Physician’s Centre
Planting Hope International
Quest Medical, Inc.
SAE International
San Antonio River Authority
Sandia National Laboratories
Sentient Energy
Shell
Siemens
Smart Harness Systems, LLC
South Texas Advancement Resource (STAR)
STAR Programs
T STAR LLC
Talon Controls
Texas A&M AgriLife McGregor Research Center
Texas A&M Engineering Experiment Station
Texas A&M Libraries
Texas A&M National Center for Electron Beam Research
Texas A&M Police Department
Texas A&M Sketch Recognition Laboratory
Texas A&M Small Animal Hospital
Texas A&M Soltis Center
Texas A&M Transportation Institute
Texas A&M Transportation Services
Tenaris
TeraVolt Energy
Texas Children’s Hospital
Texas Heart Institute
Texas Instruments
Texas Space Grant Consortium
Texas Space Technology Applications and Research
Texas Target Communities
UPS
USDA-ARC
Veretek
ViaSat Inc.
SAVE THE DATE

APRIL 26, 2019

HALL OF CHAMPIONS
TEXAS A&M UNIVERSITY
COLLEGE STATION, TEXAS

ENGINEERING PROJECT SHOWCASE

The showcase will feature more than 200 team projects representing the work of 1,000+ engineering students from across all engineering majors. These projects include departmental capstone design projects, vertically integrated team projects, design competitions and select freshman projects.

tx.ag/engineeringshowcase

facebook.com/tamuengineering  @TAMUEngineering  engineering.tamu.edu