

Program of the



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Shaping the Future of Engineering

March 12-14, 2017



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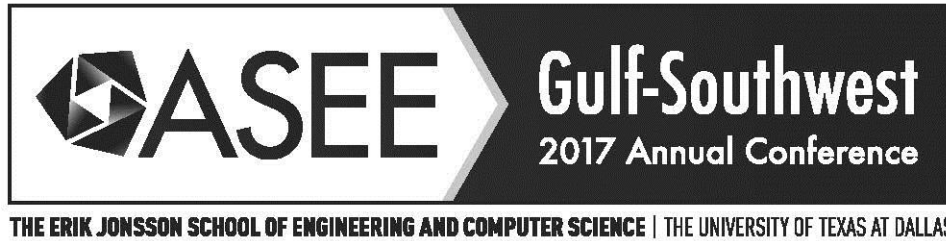
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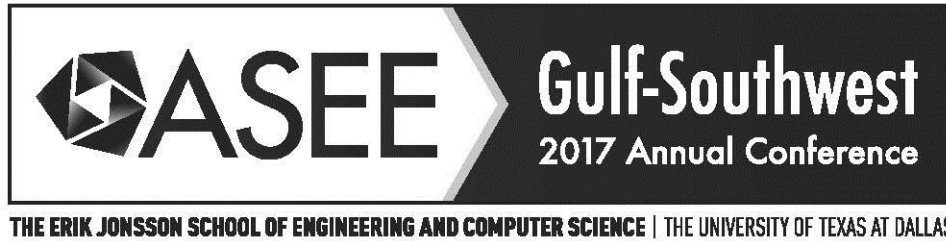


The Organizing Committee of the 2017 ASEE Gulf-Southwest Annual Conference welcomes you to Dallas (Richardson, actually)! The University of Texas at Dallas Erik Jonsson School of Engineering and Computer Science is honored to serve as the host for this year's conference. This is the first time for UT Dallas to host the conference and we hope that you will enjoy visiting the campus and the greater Dallas area.

The conference will feature 16 technical sessions. Eight of these sessions will be focused on faculty-led research related to engineering education. The remaining sessions are devoted to undergraduate and graduate research work. In addition to the technical sessions, we have planned a number of special events which are described on the following pages.

The ASEE Gulf-Southwest Annual Conference has always been an excellent forum for sharing ideas to improve engineering education. It is our goal to continue that tradition as we expect approximately 100 attendees to participate in the conference this year. We welcome your active participation as we work together to **Shape the Future of Engineering.**

— 2017 Conference Organizing Committee: Robert Hart, Nicholas Gans, Dani Fadda, Andrea Turcatti, Jennifer Klunk and Anricka Ziller



Special Conference Events

Welcome Reception

Sunday, March 12, 5:00 pm - 7:00 pm – SPN Building

The welcome reception will be an opportunity for conference attendees to register and enjoy an informal networking session with light refreshments. This event will be held in the UTDesign (capstone design) studio and will include a tour of the facility.

Exhibitors

Ongoing throughout the conference – JSOM Executive Education Center Lobby

Several exhibitors will be present to discuss the products and services they offer to support engineering education.

NSF Workshop - Got an Education Project? How to Write Your Proposal for NSF and Where to Submit It

Monday, March 13, 10:30 am - 12:00 pm – JSOM 1.517 (workshop)

Monday, March 13, 1:30 pm - 3:00 pm – JSOM 1.516 (“office hours”)

Dr. Elliot P. Douglas, Program Director for Engineering Education at the National Science Foundation will lead this interactive workshop designed to help engineering faculty understand the elements of a competitive proposal and how to get started on preparing a proposal for submission. Dr. Douglas will have “office hours” on Monday afternoon for those that would like to meet with him in person.

Keynote Address - ASEE 2017: Who We Are and Where We are Going

Monday, March 13, 12:30 pm - 1:15 pm – JSOM 1.606

The conference keynote address will be given by Dr. Bevlee Watford. Dr. Watford is a Professor of Engineering Education in the College of Engineering at Virginia Tech, a Fellow of ASEE, and the ASEE President-elect. She will discuss the current status of ASEE, what the organization has been doing, and what is being planned for the future. She will also present her preliminary plans for her term as President and beyond.



Special Conference Events

Tours

Monday, March 13, 4:00 pm - 5:30 pm – Meet at Registration Desk

Two tour options will be available. The first is a walking tour which will visit several of the main engineering teaching and research facilities on campus. The second will be a tour of the nearby AT&T Foundry. In this unique engineering innovation and design facility, AT&T works with business customers to rapidly create cutting-edge hardware and software solutions based on Internet of Things technologies. Pre-registration for the AT&T tour is required and transportation will be provided.

Dinner

Monday, March 13, 6:30 pm - 9:00 pm – Ten50 BBQ, 1050 N. Central Expressway, Richardson

Monday will conclude with an informal dinner and time for networking at a nearby restaurant. There will be a reception at the restaurant with snacks and drinks beginning at 6:30 pm and dinner will be served beginning at 7:00 pm.

Research Facilities Tour

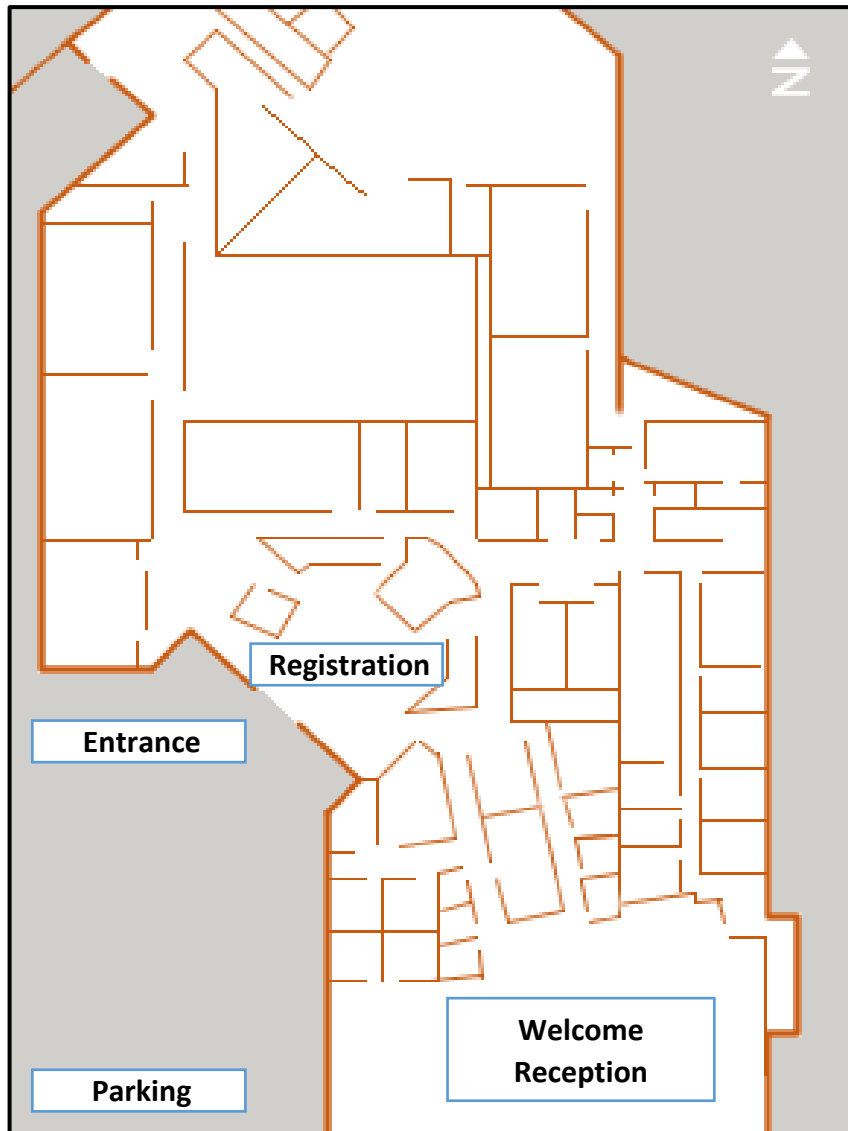
Tuesday, March 14, 10:30 am - 12:00 pm – Meet at Registration Desk

This tour will visit three of the dedicated interdisciplinary research buildings on campus. The first stop will be at one of the newest and the largest building on campus, the Bioengineering and Sciences Building which houses programs in bioengineering and neuroscience, as well as research space for related programs in biology and chemistry. The second stop will be at the Natural Science and Engineering Research Lab, home to the Material Science and Engineering Department and the Cleanroom Research Laboratory. The third stop will be at the Edith O'Donnell Arts and Technology Building which hosts innovative research at the intersection of engineering and fine arts.

Sunday, March 12

5-7 pm	Registration and Welcome Reception UTDesign Studio (SPN) Studio Tour
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The UTDesign studio is located in the UT Dallas Synergy Park North (SPN) Building at 3000 Waterview Parkway, Richardson, TX. The building is actually near the corner of Synergy Park and Stewart. Parking is available directly in front of the building.



UT Dallas SPN Building

Monday, March 13

7:30 am-5:00 pm	Registration	JSOM Executive Education Center
8:00 am-5:00 pm	Exhibits	JSOM Executive Education Center
7:30 am-8:30 am	Networking and Welcome	JSOM 1.606
8:45 am-10:15 am	Concurrent Session 1	JSOM 1.502 JSOM 1.508 JSOM 1.517
10:15 am-10:30 am	Break	JSOM Executive Education Center
10:30 am-12:00 pm	Concurrent Session 2	JSOM 1.502 JSOM 1.508
10:30 am-12:00 pm	NSF Workshop	JSOM 1.517
12:00 pm-1:15 pm	Lunch and Plenary Session (12:30pm Plenary Session)	JSOM 1.606
1:30 pm-2:45 pm	Concurrent Session 3	JSOM 1.502 JSOM 1.508 JSOM 1.517
2:45 pm-3:00 pm	Break	JSOM Executive Education Center
3:00 pm-4:00 pm	Concurrent Session 4	JSOM 1.502 JSOM 1.508 JSOM 1.517
4:00 pm-5:30 pm	Tours	Meet at Registration Desk
5:30 pm-6:30 pm	ASEE-GSW Executive Committee Meeting	ATEC 1.201
6:30 pm-9:00 pm	Dinner at Ten50 BBQ http://ten50bbq.com/ (Dinner served at 7:00 pm)	1050 N Central Expressway, Richardson, TX 75080

Concurrent Session 1 (8:45 am – 10:15 am)

Undergraduate Student Papers I – JSOM 1.502 (Monday 8:45-10:15am)

79 “[Superimposing a Signal: A Different Method for Solar Panel Safety](#)” by A. Lambert, S. Stricklin (Texas A&M U)

Communicating over existing power lines can provide several solutions for energy management. With the ability to communicate over the existing lines, it is possible to provide cheap and reliable means to interface with different modules, which are needed to be added with ever changing regulations. At Texas A&M, one application of communicating over power lines is being explored. That is, communicating with a relay

that will interrupt power from solar panels when the AC disconnect is activated. This will allow older homes equipped with solar panels to be able to abide by the National Electric codes of 2014, which require that the power from solar panels is stopped when emergency workers cutoff power to a home. The way the communication is implemented, is by injecting a digital signal onto the power line. To do this, minimal signal conditioning is required on the transmitting side. Signal conditioning can be done by using a capacitor. On the receiver end, a filter is needed to isolate the signal so that the message can be decoded. Some issues that will need to be considered when designing these communications modules is protecting the modules from the power in the power lines. The current solution that is being explored is having a fuse on the connectors of the modules, and tapping into the power line in parallel rather than in series. The paper will cover the design process of creating the system as well as the electrical theory of communicating over a power line.

87 “Autonomous Garden Monitoring System for Project Based Learning in K-12 STEM Curriculum” by H. Rafael, J. Stockton, B. Dike, S. Herrera, M. Mendiola, P. Kelly, A. Goulart, H. Willey (Texas A&M U)

The Internet of Things (IoT) is a new direction in the field of embedded systems and control systems. IoT systems are revolutionizing manufacturing and distribution industries, and can be implemented in a wide range of scenarios. This project is an autonomous garden monitoring system involving the basic principles of IoT: wireless low power sensors, an edge device in charge of network communications, and a dynamic Cloud with an accessible GUI. This system will monitor the ambient temperature, relative humidity, UV light, and soil moisture of a garden bed. This information will be aggregated and relayed to the Cloud for analysis. Finally, the system will control an irrigation valve when the analysis calls for watering, or when a client requests it manually through the GUI. Each component of the system (sensors, gateway, cloud) will be developed modularly, so that future implementations can be easily interfaced and customized. The decision-making algorithm for the irrigation control may be edited to account for additional variables, such as weather predictions, or observe trends in the data over time. The growing field of IoT also signals the need for its incorporation into existing STEM classes. It is important that such opportunities are presented in classrooms to educate students of the possibilities and garner enthusiasm for future pursuits in the fields of science and engineering. This system can be used to supplement STEM classroom instruction, and the scalable sensor network allows for a wide variety of garden projects. This paper will examine the functionality of the Autonomous Garden System and highlight points that may be utilized or further advanced through educational projects.

53 “Analysis of Illness and Associated Environmental Factors in Okurase, Ghana” by H. Zatarain and H. Hawley (U of Texas at Tyler)

Project Okurase is an organization dedicated to improving life in a Ghana village through safe water and health care. Each summer Project Okurase hosts a Village Health Outreach for one week in which professionals are brought in to provide health care that is unavailable through the regular clinic. The clinic was held from July 11 to July 15, 2016 during which over 1,600 patients were admitted to the clinic. Almost two-thirds of the illnesses were women and only one-third men. The majority of illnesses

were due to malaria which is transmitted by mosquitos. It is well known that mosquitoes breed in standing water. Trips to water sources may be the cause of the malaria cases. In addition, many of the patients were diagnosed with worms that usually come from contaminated water and food. Thus, a clean water source could reduce the number of helminth related illnesses.

92 “Low Cost Robotic Hand that Senses Heat and Pressure” by D. Lanigan and Y. Tadesse (U of Texas at Dallas)

Human beings interact with their surroundings through mechanical manipulation assisted by sensory receptors located throughout the body. In order for robots to behave and interact with the outside world in a similar way, humanoid robots must be equipped with sensors. Many research articles have been presented on the design of humanoid systems capable of dexterous motion and sensing. However, less have been focused on low cost designs with integrated sensors. This paper outlines the design and fabrication of a low cost 3D printed robotic hand equipped with off-the-shelf temperature and pressure sensors that are integrated into the five fingertips. It can be used as a mechatronic education project for schools. An under-actuated design scheme which is capable of 15 degrees of freedom of simple, yet facile mechanical movement, is utilized, allowing the hand to grip a variety of household items while using only five actuators housed in the forearm. The servos are controlled using Arduino Mega microcontroller hardware, which utilizes feedback from the temperature sensors and pressure sensors to respond to external stimuli.

Faculty Various Topics – JSOM 1.508 (Monday 8:45-10:15am)

81 “Environmental Sustainability in Developing Economies – The Nigerian Perspective” by P. Polastri and O. Awonuga (Texas A&M U. – Kingsville)

Research studies show that developing countries contribute to environmental pollution. Governments, in an attempt to protect the environment impose regulations, but many times these are ignored and/or not enforced. Nigeria, a country rich in oil and natural resources is not an exception. The Nigerian government supplies only about 10 percent of the electricity needed in the country, forcing Nigerians to utilize other energy sources that have a direct impact on the environment, like burning wood and using diesel generators. In addition, oil exploration a major industry in the country, is another contributor to the pollution problem. Gas flaring is oftentimes the preferred and only way of disposing the by-products of this industry, mainly due to cost. Gas flaring however, introduces toxic chemicals such sulphur dioxide into the atmosphere leading to the formation of acid rain and greenhouse gases. Two major issues arise from this practice: the burning process of fossil fuels is a direct contributor to respiratory problems and oil spills pollute the land and ground water. This paper focuses on the environmental pollution experienced in Nigeria as evidenced by the burning of fossil fuels and crude oil spills. The authors propose practical ways of ending this problem by having an emphasis on environmental sustainability at the heart of every oil operations.

111 “How the Proposed Changes in ABET-EAC-Criteria 3 and 5 Effects the Assessment Process?” by A. Karimi (U of Texas at San Antonio)

A proposal has been has under consideration in the last few years there to make major changes to requirements of ABET-Engineering Accreditation Commission's (EAC) criterion 3-student outcomes and criterion 5-curriculum. The proposed changes were posted on ABET website for public review and comments with a deadline of June 30, 2016. They were discussed and voted upon during the ABET summer commission meeting min July, 2016). The EAC commission approved the proposed changes with minor modifications. The proposed changes were forwarded to the ABET Engineering Area Delegation, which has the final approval authority for any criteria changes. The EAC recommended that the delegation consider another year of public review and comment to ensure all constituents have ample opportunity to consider these latest modifications and provide additional feedback. The Engineering Area Delegation had the option of considering the following three options: i) approve the proposed criteria as written and implement, ii) delay final approval for one year and seek additional public comment, as recommended by the commission, or iii) reject the proposal. At the end of October the Engineering delegation area members voted to place the proposed changes for another year of public viewing and seek input from constituencies. It can be anticipated that the proposed changes will be approved with additional minor changes in the near future. This paper highlights the proposed changes in criteria 3 and 5 and explains how these changes might affect engineering programs. It also discusses possible effects of the proposed changes on the assessment process.

30 “Using the SCALE-UP Method to Create an Engaging First Year Engineering Course” by D. Ewing (U of Texas at Arlington)

To meet the growing demands for professional engineers, much emphasis has been placed on recruiting and retaining increasing numbers of engineering students. In response, the University of Texas at Arlington (UTA) performed a study and identified that students were ill-equipped to deal with the rigors of the engineering curriculum, particularly in the areas of problem solving, professional writing, and computer programming. Therefore, to address these areas, UTA has recently created a new first year engineering course that uses the Student-Centered Active Learning Environment with Upside-down Pedagogies (SCALE-UP) method. This presentation will include an overview of not only student performance broken down by several student groups but also early surveys showing student perception of the effectiveness of this method. The results will show that these pedagogies are effective in aiding students to learn the principles of engineering. In addition, student surveys will show that students respond favorably to the teaching strategies and learning environment implemented in the course.

102 “Undergraduate Research in Engineering Technology as a High-Impact Learning Experience” by I. Nava-Medina, A. Hill Price and M. Kuttolamadom (Texas A&M U)

The objective of this paper is to explore various formats of undergraduate research as high-impact learning experiences within engineering technology programs, and specifically in a Manufacturing and Mechanical Engineering Technology degree offered at Texas A&M University. Though undergraduate research is identified by the Association of American Colleges and Universities as a high-impact educational practice, it is not commonly encouraged or pursued within engineering technology programs (as compared to engineering programs) predominantly due to the hands-on

and experiential nature of the curriculum. This paper will outline and compare the different types of undergraduate research activities pursued by various students within this engineering technology program; these include single and multi-semester individual and group research projects, accelerated projects over summer sessions with and without university-level schedules/organization, projects having participants from multiple departments, research as part of honors theses, research involving exchange students and/or multi-location projects, and research project topics having a primarily hands-on nature vs. hypothesizing/fundamental research. The paper will conclude with reporting and reflecting on their experiences and feedback, the effectiveness of the activities as high-impact learning experiences, the lessons learned, and best practices moving forward.

85 “Educational Management: An Application of Research for Educational Outreach Programs” by K. Smith and M. Beruvides (Texas Tech U)

Higher education serves a vital role in the health and stability of our nation-state. As educational outreach programs serve distinct functions within the educational mission of higher education, often addressing identified deficiencies, this paper assesses the state of educational management within outreach programs. To address the structural application of this assessment, this research identifies managerial problems and trends relevant to outreach programs in an effort to identify potential areas of solution. In particular, the analysis utilizes publications, peer reviewed articles, as well as expert information as a means to assess the field of educational management, acknowledge managerial areas of concern, and select prospective sources of solution. The assessment concludes with recommendations for managerial improvement as well as areas for further research and partnership.

Curriculum Innovations I – JSOM 1.517 (Monday 8:45-10:15am)

5 “Stronger Student Engagement in the Undergraduate Heat Transfer Course through a Numerical Project” by D Fadda (U of Texas at Dallas)

A numerical heat transfer project was used to complement a conventional heat transfer lecture course and its corresponding heat transfer lab. The numerical project helped students relate to the heat transfer course material and improved their engagement. The students were observed to exchange ideas and help one another with understanding heat transfer concepts. Student’s response, obtained from a survey, revealed a desire to perform numerical projects in addition to attending lectures and performing physical experiments.

15 “Introduction of the Construction Decision Making Inventory (CDMI) to Improve Educational Experience” by T. Sulbaran (U of Southern Mississippi)

Each learner has different characteristics, learners are not a homogenous mass, but vary considerably in terms of educational background, income, age and learning experience. These differences affect how they make decision and perform as practicing professionals, educators and students in the Architecture, Engineering and Construction (AEC) industry. These decisions impact each individual project that

collectively represents the construction industry which is one of the largest economic sectors of most localities, states and countries around the globe. Although research has been done in decision making and some psychometric instruments exist in this area, there was no tool that allowed to measure the decision making process of the AEC practicing professional and students. Thus, the focus of this research paper is to introduce the Construction Decision Making Inventory (CDMI) that was recently developed by Dr. Tulio Sulbaran to fill this important gap in the AEC industry. The content of this paper is very important as it helps better understand practicing professionals, educators and student. This understanding of how students make decisions has the potential to allow educators to tailor their classes to target the specific decision-making dimensions of the students and therefore improving the educational experience and achievements of the students.

21 “A First-Year Design-Based Activity for Mechanical Engineering Students” by O. Rios and D. Fadda (U of Texas at Dallas)

A team-based design activity administered to first-year mechanical engineering students is discussed in this paper. The activity introduced freshman students to various aspects of the engineering design process including participating in effective brainstorming sessions, the importance of iterations in design and documenting a design. As part of this activity, the students learned to create 3D models of parts and assemblies. A survey consisting of questions implementing a 5-point Likert scale as well as free-response questions was conducted to obtain feedback from the students. The survey addressed the student’s enjoyment of the project and its engineering value. Results and interesting comments from the survey are presented along with planned improvements to the activity based on the student's feedback.

36 “Introducing CWDM for 40Gb/s and 100Gb/s Ethernet to Engineering Technology Curriculum” by S. Wang (U of North Texas)

Since the approval of the 40Gb/s and 100Gb/s Ethernet standard (IEEE 802.3ba) in 2010, 4 x 10Gb/s channel coarse wavelength division multiplexing (CWDM) and 4 x 25Gb/s channel CWDM have been adopted and put into practical use as a standard for transmission of data streams over a 10km or 40km single mode optical fiber. To keep students’ knowledge and skills current with the new technology development and prepare them to succeed in today's fast paced world of electronics and communications, an existing course has been revised and updated to include CWDM principles and their implementation examples in the curriculum. Challenges to include CWDM in the current curriculum include the fact that a different set of knowledge and skills on optical sources, photodetectors, amplifiers, etc. need to be integrated into the current one-semester course that only briefly introduces optical fiber communications. We present in detail the challenges and the methods we use to overcome them.

107 “Implementing Sustainability with a Solar Distillation Project” by R. Issa, K Leitch, and B. Chang (West Texas A&M U, U of New Haven)

Students in the mechanical and civil engineering programs at West Texas A&M University are exposed to sustainability in a wide variety of required courses in the freshman through senior level coursework. The projects in these courses are carefully selected to provide an in-depth understanding of sustainability through analytical and

experimental studies. In thermal-fluid design, students were asked to build an environmentally friendly and energy efficient system for the distillation of wastewater produced in agricultural processing facilities in west Texas. The solar still was to be augmented with evacuated solar tubes collector to enhance the solar performance of the still and increase the daily production yield rate. West Texas is a dry land area with an annual rain fall of less than 20 inches per year. This project addresses the need set into effect by water management practices for this region regarding water conservation, reuse and reclamation of wastewater to extend the life time of the Ogallala Aquifer, a major source for water irrigation. Due to having low investment and operation cost, students learned that solar distillation is a feasible system for use in semi-arid and arid regions where solar energy is abundantly available. Field tests show the augmentation of the still with evacuated solar tubes increased its production rate by 263%. The maximum daily production was 1.4 kg/m²day for the passive distillation system, and 3.6 kg/m²day for the active distillation system.

Concurrent Session 2 (10:30 am – 12:00 pm)

Undergraduate Student Papers II – JSOM 1.502 (Monday 10:30-12pm)

18 “VacMAPS (Vaccine Management and Preservation System)” by J. Harbuck, A. Macias, J. Weaver, and J. Weber (U of Texas San Antonio)

The objective is to design, analyze, build, and test a management and preservation system for refrigerated vaccines that monitors temperature and expiration dates. Data gathered on current refrigerated vaccine management practices within the medical field reveal a need for a low-cost method that would mechanize and computerize the storage, inventory, and retrieval of refrigerated vaccines. The resulting solution is VacMAPS, which stands for vaccine management and preservation system. VacMAPS can be retrofitted into existing medical refrigeration systems to store, inventory, and retrieve refrigerated vaccines. The scope of VacMAPS in the vaccine cold chain is to improve the vaccine storage and handling at a medical provider’s facility for refrigerated vaccines within the range of 36 to 46 degrees Fahrenheit. The device consists of a support base, vertical rotating carousel for storage, motor, 2-D barcode scanner, electronics for monitoring and controlling supply, and inventory software.

40 “Using Photogrammetry to create a Virtual Campus Tour for the HTC Vive” by J. Collier III, J. Lewis, and B. Bernard (Schreiner U)

Traditionally, virtual worlds have been limited to what creators can build using software on a workstation and display on monitors or projectors. Using three relatively new technologies that have been previously limited to large corporations or government entities, it is now possible to create realistic 3D simulations accessible to the consumer market on virtual reality headsets. By using a UAV with a high resolution camera to quickly photograph entire buildings or campuses, photogrammetry programs create

usable 3D objects for import into the Unity Game Engine. Then, by using the HTC Vive, abstracted control in the form of keyboard, mouse or gamepad are largely eliminated and users receive an immersive experience where they look with their head, move with their feet and lift with their arms and hands to explore the created virtual world.

54 “Design Analysis and Environmental Impacts of Access Roads in Okurase Village, Ghana, Africa” by A. Madelyn Lackey and H. Hawley (U of Texas at Tyler)

Okurase is a small village located in the Eastern Region of Ghana with a population of approximately 3,000 people. Project Okurase is a Non-Governmental Organization dedicated towards creating the Nkabom Center. One factor inhibiting completion of this project is a road capable of withstanding environmental elements and transporting materials to the construction site. The proposed roadway runs through the center of the village connecting the people to the building and a method for material shipments. In July, 2017 a Garmin eTrex handheld global positioning system (GPS) was used to take longitude, longitude, and elevation data along the proposed roadway in order to design the roadway. Measurements were taken with steel tape measure and odometer to stake out the width of the road. This roadway is designed to be 20 feet wide with an additional 7 feet for pedestrians. The road top will consist of dirt fill and rural paving materials.

97 “Hand-held Mobile Technology in a Freshman Course for Enhanced Learning” by J. Attia, M. Tembely, L. Hobson, and P. Obiomon (Prairie View A&M U)

A large percentage of students in engineering programs change majors in the first two years, possibly due to teaching approaches not suitable to the students. Hands-on tools have been proposed to improve engineering education and prepare future engineers for careers in their respective disciplines. This paper presents the results associated with the impact of hand-held mobile technology, specifically the Analog Discovery Board, on student learning in a freshman class for electrical and computer engineering students. The post-survey results indicated the students were satisfied with the use of the ADB.

104 “The Resurrection of a Seiko D-Tran SCARA Arm” by R. Bergstresser, R. James, V. Nicholas, L. Suarez, R. Glenn and M. Robinson (U of Texas at Tyler, Baylor U)

Robotics, an interdisciplinary field, plays an integral role in medical and biological laboratory settings. Robotic systems allow laboratories to increase production and optimize scientist’s experimental processes. Selective Compliance Assembly Robot Arm, or SCARA, is a robot system consisting of three motors controlling its XYZ coordinate system. The SCARA arm, with the support of a pneumatic system, is able to operate attachments performing various tasks. The robot was not in production due to lack of components, and was only able to perform basic movement. The code that was initially written for the robot was simplistic consisting of being taught points and making the jumps between them. This paper reports on the resurrection of a SEIKO D-Tran TT8450 and the associated SRC-320 assembly robot controller provided by Baylor College of Medicine’s Human Genome Sequencing Core (HGSC). The goal of this research project is to bring the SCARA arm back into production.

Graduate Student Papers I – JSOM 1.508 (Monday 10:30-12pm)

2 “Performance of a Resistance-Based Heater and Temperature Sensor: A Natural Convection Study” by N. Mohammadi, D. Fadda and S. You (U of Texas at Dallas)

Natural convection heat transfer was investigated in a water pool using a horizontal heater. The purpose of this investigation was to validate, using single phase heat transfer, the heater’s performance. The heater, composed of a thin film resistor, was fabricated at the bottom surface of a silicon chip. Employing resistance-based temperature detecting technique, the thin film heater was also calibrated and used as a temperature sensor. This technique of temperature measurement allows real-time temperature data collection and is more reliable than conventional thermocouple measurements. This heater can be used in several complex heat transfer research applications. The experiment was conducted using water at quiescent temperatures of 40°C, 60°C, and 80°C. Experimental results were then compared to computational fluid mechanics simulation results, as well as to an empirical correlation available in the literature for single phase natural convection; the comparison between these results revealed similar trend and close agreement.

4 “Does Curb Appeal Really Have an Effect on Property Value of Single Family Dwellings?” by Y. Wadhvani and I. Choudhury (Texas A&M U)

The purpose of this study is to ascertain whether curb appeal has any effect on the property value of a single family dwelling. Curb appeal is generally defined as the general attractiveness of a house or other piece of property from the sidewalk, often used by home builders or realtors to evaluate a piece of property. It continues to be used as an indicator of the initial appeal of a property to prospective buyers. For this study, curb appeal has been measured by the level of maintenance of front yard, external features of a house (as viewed from the street side), landscaping, and territorial personalization of the yard. Some known predictors of the property value of a single family dwelling, such as total built-up area, the number of bedrooms and bathrooms, lot size, and location have been included in the statistical model for the study a sample of 112 single family dwellings from twelve neighborhoods in two neighboring towns in Texas, USA. The statistical technique used for data analysis is Pearson’s Correlation. Results show a statistically significant relationship between curb appeal and property value of single family dwellings in Bryan & College Station, Texas.

25 “Student Misconceptions of Work and Energy in Engineering Dynamics” by G. Liu and N. Fang (Utah State U)

This paper presents a comprehensive review of student misconceptions about work and energy, two fundamental and critical concepts in engineering mechanics education. Compared to other research topics about force and acceleration, work and energy are two higher level concepts that many students have difficulty in understanding. Misconceptions of work and energy are different from those of force and acceleration in many ways, including definitions, applications, and the breadth of knowledge involved. In the present study, a total of 23 student misconceptions of work and energy (in particular, mechanical energy) are identified based on a comprehensive literature review as well as the observations of the authors of this paper in and outside

the classroom. These 23 misconceptions are grouped into two major categories and seven sub-categories. Some reasons that cause student misconceptions are also discussed.

33 “Network Congestion Control and Low-Rate Denial of Service Attacks” by R. Rabie and P. Cotae (U of the District of Columbia)

In the world of networking, speed and accuracy are very important and must be considered as efficiency measurements factors. However, when network congestion occurs the data can be lost and the traffic speed reduced. This network congestion occurs when a network device, e.g. a router, carries more data than it can support. The network congestion can be controlled by using different kinds of Network Congestion Control Protocols. In this paper, we focus on a Transmission Control Protocol (TCP) type of Network Congestion Protocol. Low-Rate Denial of Service (LRDoS) attacks use a malicious protocol to disable networks through the TCP Congestion Protocol. In this paper, we simulated both the traffic of users and attackers using a NS-3 network simulator and Wireshark. In addition, we used MATLAB to simulate a sigmoid filter to help us analyze both types of traffic.

109 “The Impact of View and Accessibility Amenities on High-Rise Residential Properties in the City of Dhaka: A Hedonic Pricing Model” by F. Yasmin, M. Haque (Texas A&M U)

The value of residential properties apparently depends on a number of variables such as size of the property, number of rooms, type of construction materials etc. However, the external attribute, for instance, costs of view and accessibility amenities associated with housing, also play important roles to determine the price of real estate. This paper examined how view and accessibility amenities impact the value of high-rise residential properties in a densely inhabited city, Dhaka. The hedonic pricing method is used here to measure these external benefits. It also investigated for suitable variables in order to explain the benefits of view and accessibility amenities in hedonic pricing studies. Findings of the result revealed that view and accessibility amenities are an appreciated environmental attribute and property prices also reflect their benefits. The findings have significant implementation which can be used by developers as well as clients to determine the cost of property before any investment.

National Science Foundation Workshop – JSOM 1.517 (Monday 10:30-12pm)

“Got an Education Project? How to Write Your Proposal for NSF and Where to Submit It” presented by Elliot P. Douglas, Program Director for Engineering Education, National Science Foundation

Many faculty have ideas for new education projects but may not be sure of how to turn that idea into a fundable proposal. This interactive workshop will help engineering faculty understand the elements of a competitive proposal and get them started on preparing a proposal for submission. It will cover key elements of proposals, helpful hints and fatal flaws, and how the submission and review process works.

This workshop will also describe current opportunities for funding of engineering education projects available through the National Science Foundation. NSF education programs span the range from foundational to scale-up research, and include opportunities for investigators new to educational research. There are also programs intended to support institutional change efforts.

Concurrent Session 3 (1:30 pm – 2:45 pm)

Undergraduate Student Papers III – JSOM 1.502 (Monday 1:30-2:45pm)

[94 “An Automatic and Remotely Accessible Hydroponic System” by J. Johnson, O. Chavez, D. Kumbera, B. Widow, O. Zuniga, M. Moges, C. Soneja \(U of Houston\)](#)

Hydroponics is a soilless method of growing plants that exposes the roots of the plant directly to water. Hydroponics also allows precise control of the amount of nutrients being supplied to the plant and also emulates the correct environmental conditions required for the growth of a certain kind of plant. This method is useful in urban environments where outdoor space is limited because it allows plants to grow not only indoors but also vertically using lights to simulate the patterns of daylight and other actuators to emulate the environment. The drawbacks to traditional hydroponic systems are the specialized knowledge and the amount of hard work required to operate these systems easily. This paper presents a hydroponic automation solution for various growing conditions such as the temperature of the growing tray, the humidity of the growing area, the pH or alkalinity of the water in the reservoir, electrical conductivity (EC) of the nutrient solution/water mixture, and the water level of the reservoir. Users can interact with the system remotely via a website which monitors the environmental conditions recorded by the sensors inside the growing tray and allows them to perform basic tasks within the system using a set of actuators like a pump, LED lights and humidity control fans.

[95 “Enhancing access to technology and education using mobile computer lab” by I. Garay, C. Abad, J. Osorio, S. Pan, J. Sanchez, M. Moges, D. Benhaddou and C. Soneja \(U of Houston\)](#)

With technology advancing at a rapid pace, a quality education should be essentially within reach to anyone with a desire to learn. However, many regions lack the resources to provide students with the knowledge they deserve. To tackle this global issue in the rural areas like Mali, Africa, our team proposed and constructed a mobile computer lab. The purpose of this project is to create a safe, adaptable, and self-powered computer lab for children with no infrastructure in internet. It is all powered by solar energy, housed in a metal shipping container for safety, built to withstand adverse conditions in any region and be self-sustainable for up to 10-15 years. This project is funded partially by a non-profit community, aiming at eradicating illiteracy by providing simple and energy-efficient solutions. Additionally, with safety measurement being

taken into consideration and the portability of the project, it will help to save cost of production and provide convenience of use.

23 “Failure Analysis of Spiral Tube Heat Exchanger” by A. Sexton, P. Caparelli, H. Bostanci, J. Davis (U of North Texas)

The failure modes of a Spiral Tube Heat Exchanger (STHE) are analyzed in this study, including thermally induced stress, flow induced vibration, and fatigue failure. First, a single spiral tube is analyzed using ANSYS Mechanical to map the temperature distribution, thermal expansion, and thermal stresses along the tube. Then, vibration excitation mechanisms are calculated considering fluid-elastic instability and periodic wake shedding. Finally, fatigue failure is examined by computing and comparing fatigue life cycles of different materials. Based on the results, the location of maximum thermal stresses and crack formation, the most severe cause of tube vibrations, and the approximate operation years are found. Thus, with the help of the analysis, the potential failure modes of STHEs are determined and ranked from the most to least likely cause of tube failures, and recommendations are made to help prevent future tube failures or to prolong the life of STHEs in operation.

29 “MRI Image Reconstruction using Compressive Sensing” by K. Cartwright and M. Robinson (U of Texas at Tyler)

The increased use of MRI scans for diagnosis in the medical field, calls for a way to produce results in a quicker manner. Our research will investigate the effects of varying the regularization parameter in Compressive Sensing (CS) reconstruction, and compare CS reconstruction with conventional techniques.

Graduate Student Papers II – JSOM 1.508 (Monday 1:30-2:45pm)

42 “A Framework for Teaching Web Application Development Without Getting Lost in the Technology Universe” by M. Angulo and O. Aktunc (St. Mary’s U)

The World Wide Web has evolved from a static environment to become a highly dynamic platform where a multitude of interactive web applications are created every day. A plethora of new technologies have been developed to enhance the user experience and developer productivity in recent years. These recent advances in web application development have brought into existence new concepts and technologies that Computer Science and Software Engineering students should know. Instructors face various challenges teaching technology-oriented courses in Computer Science and Software Engineering areas. One of these challenges choosing the right set of technologies to deliver the course content to prepare students for industry jobs. In this paper, we present a framework for teaching web application development using a technology stack that meets the industry standards and provides the opportunity to teach the crucial concepts within one semester.

59 “System Identification Using Adaptive Filter with Recursive Least Squares Algorithm” by M. Khan Mohammed, C. Leung and S. Chilukuri (Texas A&M U Kingsville)

In this paper, we are going to implement the Recursive Least Squares (RLS) algorithm with adaptive filter to identify an unknown system on TMS320C6713 DSK (DSP Starter Kit) and using Code Composer Studio (CCS) v. 6.2. In this technique, an unknown system is arranged in parallel with the adaptive filter and a common signal is applied to both filter and unknown system. The difference from both system outputs is fed back to the adaptive filter where the RLS algorithm updates the filter coefficients and process is repeated. When the error reaches to its minimum value, the output of the adaptive filter represents the unknown system.

89 “Effect of cross sensory processing of unimodal stimulus on occipital – parietal cortex coherence and event-related potential in autistic and control” by M. Shoushan and M. Baker (Texas Tech U)

This study aimed to investigate and analyze the autistic neural cognitive response for auditory and visual tasks employing several analytical techniques, including Electroencephalography (EEG) coherence and Event-Related Potential (ERP) analysis. EEG was conducted on twenty-one participants, ten Neurotypical Controls (CON) and eleven autistic, Autism Spectrum Disorders (ASD), subjects. Participants responded to sensory tasks that included auditory and visual patterns with wait and response screens. Participants were expected to identify whether the patterns introduced were the same or different. Three different analysis algorithms were consistent to present the high correlated cortical activity between occipital and parietal channels for ASD when response was studied after first visual stimulus and after second audio stimulus presented in the same task. They were: Magnitude squared coherence, Event related potentials (ERP) and ERP grand mean average. Studying P300 and N400 components elicited that ASD do not have less deficiency than CON in processing perceptual nature information and exhibit strong visual memory responses and expectation integrated ability.

103 “Power Production and Noise Generation of a Small Wind Turbine in a Wind Tunnel Testing Environment” by A. Hays and K. Van Treuren (Baylor U)

Renewable energy has become more important to meet current energy demands as conventional energy sources are being depleted. While large scale wind turbines have made an impact on renewable energy, a new and upcoming topic is that of small wind turbines, particularly horizontal-axis wind turbines (HAWTs). These small wind turbines can be used for a wide range of applications based on the amount of power needed. Many of these applications can be in an urban environment, which creates new challenges during the design phase. Urban environments may not be the ideal location for wind power generation, but with proper design of the surrounding buildings and wind turbines, power production can be greatly increased for the available wind resource. A concern arises with the urban environment is the noise generation of these turbines. Due to this noise generation, wind turbines in an urban environment must be optimized not only for maximum power production but for minimum noise generation as well. This research focuses on the power production and noise generation of two different wind turbine rotors in a wind tunnel testing environment. These rotors were designed using the Blade-Element Momentum Theory, one rotor using the National Renewable Energy Laboratory (NREL) S823 airfoil and the other using an Eppler 216 airfoil. The NREL S823 is a low Reynolds number, small wind turbine, airfoil designed by NREL and has

been extensively tested at Baylor University. The Eppler 216 is a low Reynolds number, high lift airfoil that has been chosen based on its high lift for low drag. Each rotor was tested at wind speeds ranging from 2.25 m/s (5 mph) to 6.7 m/s (15 mph). Point noise measurements were taken at three different locations downstream of the wind turbine rotor. At each of the three locations downstream, a vertical traverse was performed in 1.25 cm (0.5 in.) increments from the top of the wind turbine to the bottom. From preliminary tests, the tips of the turbine blades generate more noise, due to the higher velocities, when compared to the hub section. The support post of the turbine also generates more noise, thus making the bottom half of the turbine louder.

STEM & K-12 – JSOM 1.517 (Monday 1:30-2:45pm)

13 “Robotics service learning for improving learning outcomes and increasing community engagement” by P. Bhounsule, D. Chaney, L. Claeys and R. Manteufel (U of Texas at San Antonio)

Service Learning (SL) is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities. Students in a technical elective robotics class in the Mechanical Engineering Department at the University of Texas at San Antonio (UTSA) opted for either a final project or service learning for 25% of their grade. For SL, the students had to work with elementary and middle-school children in San Antonio over a period of 10 weeks to mentor them on building and programming robots with LEGO® Mindstorms® for the FIRST® LEGO® League tournament. In parallel, the undergraduates also learnt LEGO® Mindstorms in the class by creating robots for assigned labs. This way they were able to apply concepts taught in the class towards community service. As part of the service learning option, the students completed self- reflection journal entries before-, middle-, and end-of the program. For assessing the SL, the undergraduate students were administered a survey at the end of the program. The self-reflection journal entries indicated that the main challenge faced by the students was their self-doubt about their ability to teach robotic and engineering concepts and to sustain the attention of the children. The surveys indicated that the students felt SL motivated them to learn and improve understanding of the course material. Students also felt that there should be more SL options in the Engineering curriculum. Finally, an analysis of students’ grades in the course indicated that those who selected the SL option scored one grade higher than students who did the final project option. Our conclusion is that SL is a promising approach to improve students learning outcomes while benefitting the community.

74 “Self-Efficacy and STEM Knowledge Exam Scores in a Short-Term Middle School Intervention Program: A Pilot Study” by T. McClary, G. Degardin, J. Kulpa, P. Sullivan and K. Trujillo (New Mexico State U)

Studies have shown that self-efficacy is a particularly important variable in the performance of students from underrepresented backgrounds, including females, and African American, Native American, and Hispanic students. Self-efficacy has been shown to be a reliable predictor of academic performance and likelihood to pursue

technical and scientific careers, and in many cases has been studied as a predictor of test scores. The vast majority of self-efficacy studies have focused on long-term interventions based on academic performance. This paper will present findings from a two-week STEM intervention on confidence and STEM knowledge among middle school participants. The paper will further explore the relationship between these variables and significant increases in either knowledge-based content exam scores or confidence survey scores pre- and post-program participation.

96 “Girls in Engineering, Math and Science (GEMS) Camp at the University of Incarnate Word” by S. Ande, O. Caglayan and E. Coronado (U of the Incarnate Word)

Girls in Engineering, Math and Science (GEMS) Camp was started by the University of Incarnate Word in 2015 as an effort to increase the number of female students in the Science, Technology, Engineering and Mathematics (STEM) fields, particularly in engineering, through active engagement and inspiration. In order to maximize the outreach to as many high school female students as possible regarding the GEMS camp and inspiring them towards choosing a STEM career, high school students in San Antonio were invited to the GEMS camp to participate in hands-on engineering activities. Students gained valuable experience through challenging activities that emphasized Civil and Electrical Engineering. The students presented their experiences, and the knowledge gained throughout the projects, by creating and delivering a group poster presentation at the end. The outcomes of the camp included student’s increased ability to conceptualize engineering problems and an increased engagement in engineering by incorporating visualization tools in the classroom environment.

99 “The Heroes Behind the Heroes of Apollo-11: Role of STEM” by J. Hansen, L. Kaushik, C. Yu, and A. Sangwan (U of Texas at Dallas)

During Apollo-11 project, countless scientists, engineers, technicians worked behind the scenes to ensure that both the solutions and the execution of the detailed flight plan was a success. It is our goal to create an interactive application that allows users to explore NASA’s archive of Apollo missions. The application is specifically aimed at younger users, on the purpose of engaging K-12 students, inspire them to grow interest to get into scientific fields of study, and promote the positive nature of the space program.

Concurrent Session 4 (3:00 pm - 4:00 pm)

Freshman Experience – JSOM 1.502 (Monday 3-4pm)

27 “An Interdisciplinary Approach to Undergraduate Retention and Success” by H. Shipley, R. Bizios, K. Castillo, and R. Guo (U of Texas at San Antonio)

The University of Texas at San Antonio (UTSA) is a Minority Serving Institution and has seen rapid growth in the last 10 years; however, student income levels have not improved and UTSA is also considered a low-income serving institution. Therefore,

many of our College of Engineering (COE) students have to work extra hours off-campus to meet financial needs and have limited opportunities to participate in on-campus activities focusing on their major. An interdisciplinary faculty team from mechanical engineering, civil and environmental engineering, biomedical engineering, and electrical and computer engineering created a Scholarship Program for Undergraduate Retention and Success (SPURS) with the support of NSF's S-STEM initiative. The proposed program consists of an integrated approach to increase the number and graduation rate of undergraduate students who enroll in the College of Engineering.

31 “A Comparative Analysis of Underrepresented Minority Groups Taking a New First Year Engineering Course” by D. Ewing (U of Texas at Arlington)

The University of Texas at Arlington (UTA) enjoys a culturally diverse and rich student body that includes many underrepresented minorities and the university has been designated as a Hispanic Serving Institute (HSI). As part of its mission, UTA has been seeking strategies to increase retention of their engineering student population. A new first year engineering course was created at UTA in order to address this issue, especially as it applies to retaining students within underrepresented minority groups. Specifically, the course utilizes active teaching and learning methods that have shown to be especially effective not only for engineering students as a whole, but in encouraging underrepresented minorities to gain the knowledge and confidence they will need to further their academic and professional careers. This presentation will compare the student performance metrics for all participating student populations to assess the effectiveness of this new class as it relates to underrepresented minorities.

112 “Teaching Innovation to Freshmen Engineering Students” by R. Desai (Midwestern State U)

Companies profit and grow through the development of innovative products and designs. Thus, industries invest substantial parts of their profits into research and development, seeking the most innovative ideas and employees to find those ideas. Employees are motivated to be creative, especially when the potential for recognition exists. Engineers are often the leaders of product development teams. For product development in industry, a structured plan may be used to encourage brainstorming and help enhance creativity. This is why innovation, entrepreneurship, and leadership are critical skills for engineering students.

Graduate Student Papers III – JSOM 1.508 (Monday 3-4pm)

71 “Nonlinear modeling and performance analysis of electret-based energy harvesters” by J. Cenicerros, H. Abdelmoula, B. Hammad, A. Abdelkefi, P. Sullivan (New Mexico State U)

Harvesting energy using electrostatic transduction mechanism is investigated. The energy harvester is composed of a cantilever beam attached to an electrode on the tip of oscillating upper an electret material. A nonlinear distributed-parameter model is developed to model the present coupling between the displacement of the beam and

the harvested energy. A static analysis is carried out to determine the impacts of the electret voltage on the static deflection and pull-in instability. Second, an eigenvalue problem analysis is performed to study the impacts of the electret voltage on the natural frequencies of the harvester. Our preliminary results show that an increase in the electret voltage is accompanied by a decrease in the natural frequency and hence gives the opportunity to harvest energy at low frequency excitations.

72 “Resilient Masonry Walls System: A framework for future construction systems development” by N. Atlam, H. Mirenayat, and M. Darwish (Texas Tech U)

Disasters come from the overlap between natural hazards and vulnerable construction systems. This paper introduces a new approach in a new construction system dubbed “resilient masonry walls” that is resistant to natural catastrophes such as earthquakes, wildfires, hurricanes, tornadoes, and floods. The proposed approach takes into consideration a total of 7 parameters which includes environmental, social, and economic impact. These parameters are grouped into a new rating system known as the Success Factor System (SFS). In order to better understand the current SFS, a comparative study on the subject is introduced in this paper. Extensive surveys were implemented in several regions within the United States. The proposed approach functions as a metric for quantifying degrees of similarity among the case study buildings, and identifies operationally approved methods from analogous construction wall system development. The outputs of this study have an important value to evaluate and increase the potentiality of resilience and sustainability of current buildings; as well as suggest future development strategies in a way that address climate change challenges.

68 “Business Survival in Construction Industry in Relation to Other Businesses: A Comparative Analysis” by S. Kakkad and I. Choudhury (Texas A&M U)

Construction industry is one of the largest industry in the United States that employs close to seven million people and contributes the highest to the growth of the country’s economy. In spite of the huge impact that the industry has on the US economy, construction businesses have a hard time surviving in the market, with construction companies having the least survival rate among all the industries. Only 36.4% of new construction companies had survived in the past 5 years since 2012. This study aims at providing evidence that the construction industry suffers the most as compared to the other industries in terms of business survival rate.

Capstone Design and Ethics Education – JSOM 1.517 (Monday 3-4pm)

43 “Senior Engineering Capstone Project: Modular Advanced River Barge System (M.A.R.S)” by A. Whittemore, O. Caglayan, Y. Galvez, P. Giebler, A. Grossman and M. Martinez (U of the Incarnate Word)

To celebrate the 300th anniversary of the founding of the city of San Antonio, the San Antonio River Authority (SARA) and the American Institute of Architects (AIA) sponsored an open competition for a redesigned river barge. The Spring 2016 Senior

Capstone engineering students at the University of the Incarnate Word submitted a design for the competition. This paper outlines their design process using the given constraints and criteria. The student team used many of their engineering classes for the design, including MatLab programming, AutoCAD, Electronics, Fluid Mechanics, and Mechanics of Materials. They created a modular design that allowed for easy configuration of multiple uses for the barge, the Modular Advanced River Barge System (M.A.R.S.). While the design was not ultimately chosen by the city, this project was an invaluable experience that provided real-world applications to a practical engineering problem.

[69 “Hypothetical Cases in Engineering Ethics” by S. Watkins \(Missouri U of Sci and Tech, US Air Force Academy\)](#)

An important educational subject for engineering students is engineering ethics. Common instructional objectives are to develop knowledge of ethical principles, e.g. professional codes, and to apply these principles to specific situations. Case studies are useful instructional examples and exercises and cases are central to student ethics competitions. Historical case studies emphasize the relevance of ethics in engineering work. Hypothetical case studies can address specific ethical principles and provide great design flexibility. This paper discusses hypothetical cases in engineering ethics in the context of instructional exercises or student competitions. Recommendations are given for the development of versatile cases and for approaching a case study or analysis. Three custom cases that were used in the IEEE Student Ethics Competition are presented as examples.

[47 “Engineering Ethics as an Expert Guided and Socially Situated Activity” by M. Grohman, E. Lee, N. Gans, M. Tacca and M. Brown \(U of Texas at Dallas\)](#)

The study aimed at investigating: the group dynamics underlying ethical decision-making in Senior Design Project (SDP) teams and research labs, and the role of ethics experts in the ethical decision-making. Using cognitive ethnography, we analyzed research activities in engineering research laboratories, and SDP teams’ discussions about ethics issues, with or without the presence of ethics experts. We found that student teams demonstrated multi-layered understanding of engineering ethics: explicit and implicit. Those two types of understanding manifested themselves differently across SDP teams. At the explicit level, SDP teams understood their technical responsibility and practical work ethics, but at the same time rarely showed appreciation for social implications or social responsibility in engineering. At the implicit level, SDP teams understanding of engineering ethics varied across teams, and it did not directly influence their ethical decision-making. Some SDP teams, however, did demonstrate implicit and broad understanding of social implications of engineering, particularly when coupled with ethics experts, and when the atmosphere was collegial. When it comes to research laboratories, voluntary ethics discussions were rarely present. Based on our results, we suggest a situated approach, such as midstream modulation in engineering labs and collaboration with ethics experts to improve engineering ethics education programs.

Tuesday, March 14

8:00 am-12:00 pm	Exhibits	JSOM Executive Education Center
7:30 am-8:30 am	Networking and Welcome	JSOM 1.606
8:45 am-10:15 am	Concurrent Session 5	JSOM 1.502 JSOM 1.508 JSOM 1.517
10:15 am-10:30 am	Break	JSOM Executive Education Center
10:30 am-12:00 pm	Concurrent Session 6	JSOM 1.502 JSOM 1.508
10:30 am-12:00 pm	Research Facilities Tour	Signup at Registration Desk prior; Meet at Registration Desk
12:00 pm-1:30 pm	Lunch and Closing Session (12:45pm Awards and Business Meeting)	JSOM 1.606

Concurrent Session 5 (8:45 am – 10:15 am)

Undergraduate Student Papers IV – JSOM 1.502 (Tuesday 8:45-10:15am)

[48 “Multi-Autonomous Vehicle Collaboration” by T. Goldaracena, M. Reyes, M. Frye, and S. Nair \(Univ. of the Incarnate Word\)](#)

The purpose of this project is to design a biologically-inspired control system infrastructure that will allow the collaboration between several autonomous ground and air vehicles. The process will involve hovering two, or more AVs around a set of several ground drones. The air vehicles will maintain constant communication, while assessing the position in which the ground vehicles are located, this will prompt the air vehicles to surround their ground counterparts, and ensure that they remain within the designated area, which will be assigned within the radius generated by the air vehicles. The idea is to achieve real-time communication between two or more unmanned autonomous vehicles, which will be assigned a particular role in the system that will dictate the behavior, and eventually complete both simple and complex tasks autonomously.

[61 “Designing a Solar Thermoelectric Generator” by R. Smith \(U of North Texas\)](#)

Global appetite for energy grows at a significant rate. Current energy generation technologies cannot be relied upon to meet this escalating curve efficiently or in an environmentally safe manner. Renewable energy generation is crucial to sustainably

meeting this need. Thermoelectrics utilize a temperature difference to induce a voltage, or conversely, a temperature difference from a voltage. A solar thermoelectric generator (STEG) utilizes a hot thermal reservoir created by solar radiation. A low-cost STEG was constructed and tested in the summer of 2015 then refined for a second device in the summer of 2016. Simple changes doubled the temperature difference across the thermoelectric module, increasing the voltage and power generated. The amount of power generated was approximately 12% of a photovoltaic cell of the same area, but improvements can supplement renewable energy generation. This device has been refined and inspired a hybrid model that combines STEG with PV cell.

63 “GPS Automation: Reducing Human Error in the Data Collecting Process” by B. Sanchez, E. Simonson and K. Nagle (Coastal Bend College)

Human error is an important factor in analyzing data and assuring that it is as feasibly accurate as possible. In our previous research, “Extending the Life of Robotics through the use of a PEMFC” we hypothesized that because all the data was obtained and controlled through analog commands, there was a significant potential for human error. This research paper explores the options and methods available to address this concern through the use of GPS for navigational purposes. In this contribution, we found that the results show different coordinate readings, despite being placed in the same location, acting as indicators of the randomness of the system. We became aware that GPS was not accurate enough to use without developing some modifications to our originally intended experiment in order to reach our initial goal to reduce human error in the data collecting process.

64 “Feasibility of Virtual Reality as an Aid in Dental Education” by S. Hawkins, E. Hernandez, E. DeLeon, C. Griffin and K. Nagle (Coastal Bend College)

This study tested the use of an Augmented/Virtual Reality system (AVRS) as an enhancement tool to increase the retention, learning, and overall student engagement in the classroom. This program was designed to evaluate the performance of Coastal Bend College (CBC) Dental Hygiene students in the classroom using virtual reality (VR) as an aid to enhance their education. The study used a simulated anatomy application of the oral anatomy of the human mouth, which was shown to freshman and senior CBC dental hygiene students. A survey, including pre- and post-test questions, was given to the students to evaluate what enhancements are needed for the program, their interest in virtual reality in dentistry, and the desire to use the program in a classroom setting. The students were also asked to evaluate the VR experience, and the researchers noted their responses. The results from the survey were compiled and analyzed to identify common trends, and students believe an AVRS like this would help future students in dental and dental hygiene related studies. Further research will be done to advance the application and target multiple courses in the dental program.

66 “WIP: Learning Languages Using Virtual and Augmented Reality” by K. Cuyler, K. Nagle, M. Maria Hernandez, E. (Coastal Bend College)

This study explores learning a new language while engaging in everyday activities as opposed to attempting to learn a language in isolation. Previous research revealed the benefit of using Augmented and Virtual Reality to enhance learning and retention. Students enrolled in a TRIO program participated in an experiment where they learned

more and retained more using a virtual reality application called "Titans of Space" compared to a traditional textbook or video. Students reported that by actively engaging in the Virtual environment, the size and the scope of space was easier to understand than the visual or graphic representations found in textbook. This research extends that concept, by exploring the use of Augmented Reality in developing a language immersion model incorporating the latest technology, thus freeing the student to go about routine tasks while utilizing the Augmented Reality gear and software.

Classroom Innovations – JSOM 1.508 (Tuesday 8:45-10:15am)

73 “Emergence of a Multidisciplinary Environment through Interdepartmental Alliances Involving a College-Specific Maker Space” by L. Martinez, E. Pines, and P. Sullivan (New Mexico State U)

Academic maker spaces at the college and broader university level are becoming commonplace as campuses strive to foster an environment for technology innovation and entrepreneurship among students and faculty alike. While easier to manage, costs associated with developing college or department-specific maker spaces can often lead to reduced scope, difficulties in maintaining equipment over time, and may even hinder multidisciplinary approaches to innovation. This paper will share the emergence of a cross-departmental multidisciplinary environment developed between engineering and art as two academic entities sought to meet what was initially viewed as disparate student needs. The developed alliance demonstrates effective first steps for fostering cross-departmental maker spaces that encourage multidisciplinary engagement, access to technical services and equipment otherwise not readily available to the broader campus community, and the ability for students to engage in real-world collaborative teams comprised of individuals with disparate perspectives.

77 “Comparing two versions of an engineering course: in-class and on-line. What does the data say?” by T. Khraishi (U of New Mexico)

This paper presents data from the same course taught differently: on-line and traditionally in a classroom. The course in question is an engineering course at the sophomore level and is entitled "Energy, Environment and Society". The paper contrasts differences in grades, or in student response/behavior, towards these two versions of the course. It also points out the wealth of data obtained using the on-line method including some interesting observations. A main result of the study is that the grades for group work activities seemed to be lower for the online mode of teaching, and that individualized exam grades (midterm and final) seemed to be similar for the two modes.

83 “Impact of Entrepreneurial Mindset Integration in a First-Semester Engineering Course” by B. Kelley (Baylor U)

During the fall semester offering of EGR 1301: Introduction to Engineering, Entrepreneurial Mindset (EM) topics were introduced as class topics on three separate occasions in two different course sections. To measure if exposure to and practice of the specific EM topic of Create Value impacted student EM awareness two different

self-assessment instruments were administered to these and several other EGR 1301 sections. The first was Fulcher's Curiosity Index self-assessment survey and was administered near the beginning of the semester. The second was Carpenter's Entrepreneurial Mindset self-assessment and was administered near the end of the course. Student responses from EGR 1301 sections containing specific EM experiences were compared to responses from students in sections without specific EM exposure. Results did not indicate that students were impacted by this limited exposure to EM topics. Results indicated that a more extensive level of EM exposure would be necessary to quantitatively affect student EM awareness.

76 "A Study of Internships and Conferences on Retention and Graduation of Undergraduate Students" by T Khraishi and K. Denman (U of New Mexico)

In this paper, the authors discuss the experiences of a National Science Foundation STEP (STEM Talent Expansion Program) award to the School of Engineering at the University of New Mexico (UNM). The setup of this STEP project is unique in the sense that it focuses its efforts and activity funding on internships and professional conference participation trips for early career engineering and computer science students. In addition to a background on the national STEP Program, the paper discusses the constructive elements of this project and the data that was collected to measure its impact. This paper represents more completed and newer data from this NSF project.

108 "Active Learning in Thermodynamics by Leaving the Front of the Classroom" by R. Manteufel and A. Karimi (U of Texas at San Antonio)

The fundamental premise of active learning is that students learn better when they both think and do. There are numerous strategies to promote active learning in a traditional engineering class. This paper summarizes one strategy used in a thermodynamics class taught in an amphitheater classroom designed for lecturing to over one hundred students. The instructor poses a question then leaves the front of the room and roams the class. Moving among students provides opportunities to engage students on a more personal level and often leads to student questions and increased engagement. Student feedback is positive that they value the time spent solving problems during class.

Accreditation and Assessment – JSOM 1.517 (Tuesday 8:45-10:15am)

17 "WEAVEonline: An Assessment and Planning Management System for Improving Student Learning" by W. Zhan and J. Porter (Texas A&M U)

Every degree-granting program at Texas A&M University is required to participate in the assessment of student learning outcomes using WEAVEonline system. The assessment data is then used to identify improvement opportunities. WEAVEonline is a management system for program assessment and planning. Specific student learning outcomes are identified or revised at the beginning of each year. Numerical target values are set. Multiple assessment methods are selected to evaluate the extent to which these outcomes are achieved. Assessment data are collected, analyzed, and uploaded to the WEAVEonline system. Each program is required to use the data to

show whether specific student learning outcomes targets are met. Weaknesses are analyzed and corrective action plans are recommended by each program. This paper discusses the experience that the Electronic Systems Engineering Technology program gained through the WEAVEonline assessment process. Topics of discussion include statistical analysis of the assessment data, trend analysis, and documentation.

20 “An ABET Preparation Perspective Under the New Proposed Criteria 3 and 5” by R. Barr (U of Texas at Austin)

This paper presents the author’s perspective on how to prepare for an ABET accreditation visit under the new proposed criteria 3 and 5. The author’s perspective is based on experience from navigating three ABET visits under the old EC2000 criteria and participating in the recent 2016 ASEE town hall meeting in New Orleans where these new criteria were broadly discussed. The focus of the paper will be on the proposed changes to criteria 3 and 5, and the current process that will eventually lead to their likely adoption. Because of the success ABET has experienced with its outcomes-based assessment process, the future focus for ABET evaluators will continue to be on attainment of the Student Outcomes (SO’s) enumerated in the new proposed criterion 3. The paper suggests ways to measure and evaluate attainment of SO’s using both direct and indirect measures. The final part of the paper will focus on the Program Educational Objectives (PEO’s) of criterion 2, and their relationship to both the SO’s and the institutional goals.

110 “Use of True-False or Multiple Choice Questions in Measuring and Improving Student Knowledge of Fundamental Concepts in Thermal Science Courses” by A. Karimi and R. Manteufel (U of Texas at San Antonio)

Electronic devices such as I>Clicker or tools in Blackboard Learn are very useful instruments in large classes to take student attendance, give true and false quizzes, and keeping students alert by participating in active learning activities. These tools are also very helpful to measure and reinforce the understanding of the fundamental concepts in the technical subjects. Use of I>Clicker has been experimented in thermodynamics and heat transfer courses in the recent years. During the class period short true/false or multiple choice questions are given to measure student understanding of the fundamental concepts covered during a class period or in the previous class periods. Students answer questions using their I>Clicker devices. The results are evaluated instantaneously and lectures are continued by focusing on the areas of students’ difficulties. Students are tested again at the end of the lecture or during the next period to gage the improvement in their understanding of fundamental concepts. Processes for the evaluation students understanding of the fundamental concepts in thermodynamics and heat transfer courses are described. These include the understanding of first law and second laws of thermodynamics, importance of such dimensional parameters as Biot, Fourier, and Reynold numbers. Few examples of questions used in the evaluation of student knowledge of fundamental concepts are included. The results of a survey conducted at the end of semester to get students’ perception of using I>Clickers, the understanding the fundamental concepts, and the possibility of using I>Clickers in a “Flip Lecture” scenario are also presented.

Concurrent Session 6 (10:30 am – 12:00 pm)

Undergraduate Student Papers V – JSOM 1.502 (Tuesday 10:30-12pm)

70 “Automated Testing of Orion Cockpit Displays using EggPlant Functional and Python Programming” by S. Auzennea, M. Dumantayb, M. Issaa, J. Vidañab, M. Sourisc, M Biswasa and L. Morinc (U of Texas at Tyler, NASA Johnson Space Center)

NASA’s latest spacecraft, the Orion is currently in the development process with the goal of taking humans deeper into space than ever before. The Orion is equipped with three main displays that serve as the main interfacing component when controlling the spacecraft. In order to ensure that the software behind the displays operates without error, rigorous testing must be completed. To accomplish this testing NASA elected to use the software verification program eggPlant Functional by TestPlant. EggPlant is an image-based test automation tool that allows users to create scripts to verify the functionality of a program. EggPlant uses its ability to simulate user input, along with its ability to capture and recognize on screen images to accomplish this. A team of students from the University of Texas at Tyler were tasked with writing eggPlant scripts to aid in the verification of the Orion Cockpit Displays for the Rapid Prototyping Lab at NASA’s Johnson Space Center.

84 “Investigating home-based trip-chaining behavior: An analysis of 2009 US National Household Travel Survey Data” by A. Roddy and A. Huang (Tarleton State U)

Chaining trips (a set of trip segments between home and other destinations) has become increasingly popular among travelers over time. Understanding such phenomenon in depth can not only provide insight for human travel behavior but also facilitate policy making in urban and transportation planning. To this end, we extracted home-based trip chains from the 2009 National Household Travel Survey (NHTS) data, based on which statistical analysis was performed to evaluate the effect of socio-demographics on the number of chained destinations and related trip purposes in trip chains. Our results reveal that: most home-based trip chains have one to three destinations; three top trip purposes in trip chains are work, buying goods and buying services; more children in a household are associated with shorter travel time to in both one- and two-destination trip chains; individuals in urban areas tend to make trip chains of longer travel time than those in rural areas; individuals tend to have longer dwelling time at destinations on weekdays than weekends. Our results have implications on transportation policies to reduce traffic congestion and to increase travel convenience.

62 “The Wireless Internet of Things for SensorTag Platform: An IoT Lunar Rover Project” by M. Greco, M. Johnson, R. Sharpe, J. Presley, X. Gao, E. Prucha, and B. Hur (Texas A&M U)

Due to widespread interest in the “Internet of Things” (IoT), NASA is investigating the potential uses of internet controlled systems. In response to NASA's interest, a group of seniors at Texas A&M University are proposing an IoT system called the Wireless Internet of Things for SensorTag Platform (WITS Platform) for use in lunar exploration. The team is designing and creating this integrated IoT system capable of sending and

receiving data via the internet for controlling the Digital Systems Teaching and Research (DSTR) robot. Multiple sensors will be used on the robot for environmental data collection. The data will be provided to a user interface that is also capable of sending commands to the DSTR for movement control in near real-time. The sensor data passed through the system will be stored in a cloud and be accessible through the user interface.

[75 “Designing for Community using the Project-based Learning” by A. Yazdanshenas, R. Williams, and C. Goh \(U of Texas at Tyler\)](#)

Engineering milestones: from the control of fire, to the modern clock, to our first future footsteps on mars and beyond, engineering has benefited all humankind either directly or indirectly. Therefore, one of biggest potentials of engineering is the fact that it can benefit the community. In the past six months at the University of Texas at Tyler, Engineering students have partaking in “Independent Study” and/or “Undergraduate Research” as a team in terms of “Project-based Learning”, which are composed of three independent projects, 1) Plane on a Pole, 2) Tai-Chi Ball (T-Ball) design, and 3) Dynamic Fracture Simulations. In result, it is expected that these enhanced learning experiences will allow students to directly affect their communities and work on projects that could manifest positive impact globally. Effects on the community as a result of project-based learning are in most cases in the hands of the students and could range from simple to significant.

Curriculum Innovations II – JSOM 1.508 (Tuesday 10:30-12pm)

[26 “Facilitating Innovation through Regulatory Engineering Education: An Academic Program Overview” by D. Easton and S. Szygenda \(U of Texas at Dallas, Southern Methodist U\)](#)

In the past 50 years, the medical device industry has been profoundly impacted by significant technological advancements. These new technologies, coupled with the expansion of global regulations, and changes to global regulatory requirements for biomedical products, have dramatically changed the regulatory landscape; creating new complexities affecting the innovation - to - commercialization pathways and timelines. Universities have largely provided the science and engineering curricula and research support driving the technical capabilities and aspirations of delivering these innovations for broad clinical use. However, engineering curricula have fallen woefully short for one particular consideration, namely, the explosion of new or changing regulations, and their impact and application throughout all critical stages of the biomedical product development lifecycle and, holistically, throughout the technical biomedical business. This deficiency grounds the failure of universities to consistently and reliably bridge the gap between what the engineer learns in school and what they must do on the job in a regulated industry, to effectively bring a product to market. This deficit is a global problem that seriously affects our ability to deliver critically needed biomedical solutions in a timely manner. Engineers must be equipped to navigate the increased complexity of this modern regulatory landscape, address the nuances of the biomedical industry, and lead the delivery and preservation of innovative technologies

that can withstand intense regulatory scrutiny while satisfying the clinical needs and stakeholder expectations.

98 “Vertical Integration of Engineering Courses for Effective Learning of Continuous Quality Improvement Concepts” by J. Ker and M. Khan (Louisiana Tech U, Binghamton U)

Industrial engineering juniors at Louisiana Tech University who enroll in INEN 401 Engineering Statistics II learn how to apply statistical quality control methods to monitor product quality in a traditional classroom setting while engineering freshmen enrolled in ENGR 120 Engineering Program Solving I work in teams to fabricate a small centrifugal pump in a factory-like laboratory setting. Presently, integration of INEN 401 and ENGR 120 class is nonexistent. This paper summarizes the development of an innovative way of teaching INEN 401, by vertically integrating it with ENGR 120, in a factory-like environment to enhance the overall efficiency of the pumps manufactured in ENGR 120 class. Tasks performed include identifying root causes, publishing new fabrication and assembly instructions, fabricating pumps based on new instructions, testing the efficiency of new pumps, and comparing pump efficiency. The preliminary result shows that new pump fabrication instructions developed by INEN 401 students resulted in better pump efficiency.

93 “Teaching Microcontroller Systems with a Neuromorphic Application” by S. Koziol, C. Tulowiecki, J. DiCecco, and J. Gaudette (Baylor U, Naval Undersea Warfare Center)

This paper describes a series of experiments designed to teach microprocessor system principles to students at Baylor University. This three credit class is a required course taken by third year electrical and computer engineering students. The students in this course use the Atmel AVR 8-bit microcontroller. Through a series of individual lab experiences the students will learn serial communication, MATLAB-AVR interface, SPI communication, Digital to Analog Converter (DAC) use and basic theory, Analog to Digital Converter (ADC) use and basic theory, and an introduction to Neuromorphic engineering. “Neuromorphic” is the name given to an interdisciplinary field which combines concepts from neuroscience, engineering, computer science, and biology. A Neuromorphic investigator’s goal is to design systems based on biological nervous systems. The students in this class will apply their newly learned microcontroller skills to control and read from a brain inspired analog neuron circuit.

105 “Tensor Concepts in the Engineering Curriculum” by A. Beyle and B. Maxum (U of Texas at Arlington, Lamar U)

Many concepts studied in engineering undergraduate curriculum contain inherent tensorial character, such as moments of inertia in Statics and Dynamics, stresses and strains in Mechanics of Solids, stress and strain rates in Fluid Mechanics, Maxwell’s stress tensor in Electromagnetics, and momentum flux in Continuum Mechanics and Physics. This tensor nature is inherent in the study of anisotropic media, thermal conductivity, linear thermal expansion, stiffness, compliance, electrical conductivity, dielectric permittivity, and magnetic permeability. These topics are all taught in undergraduate engineering courses. However, in institutions where the mathematical preparation for these topics is limited to scalar and vector quantities, there exists considerable effort to contort the mathematics to force the physics to fit the restrictions

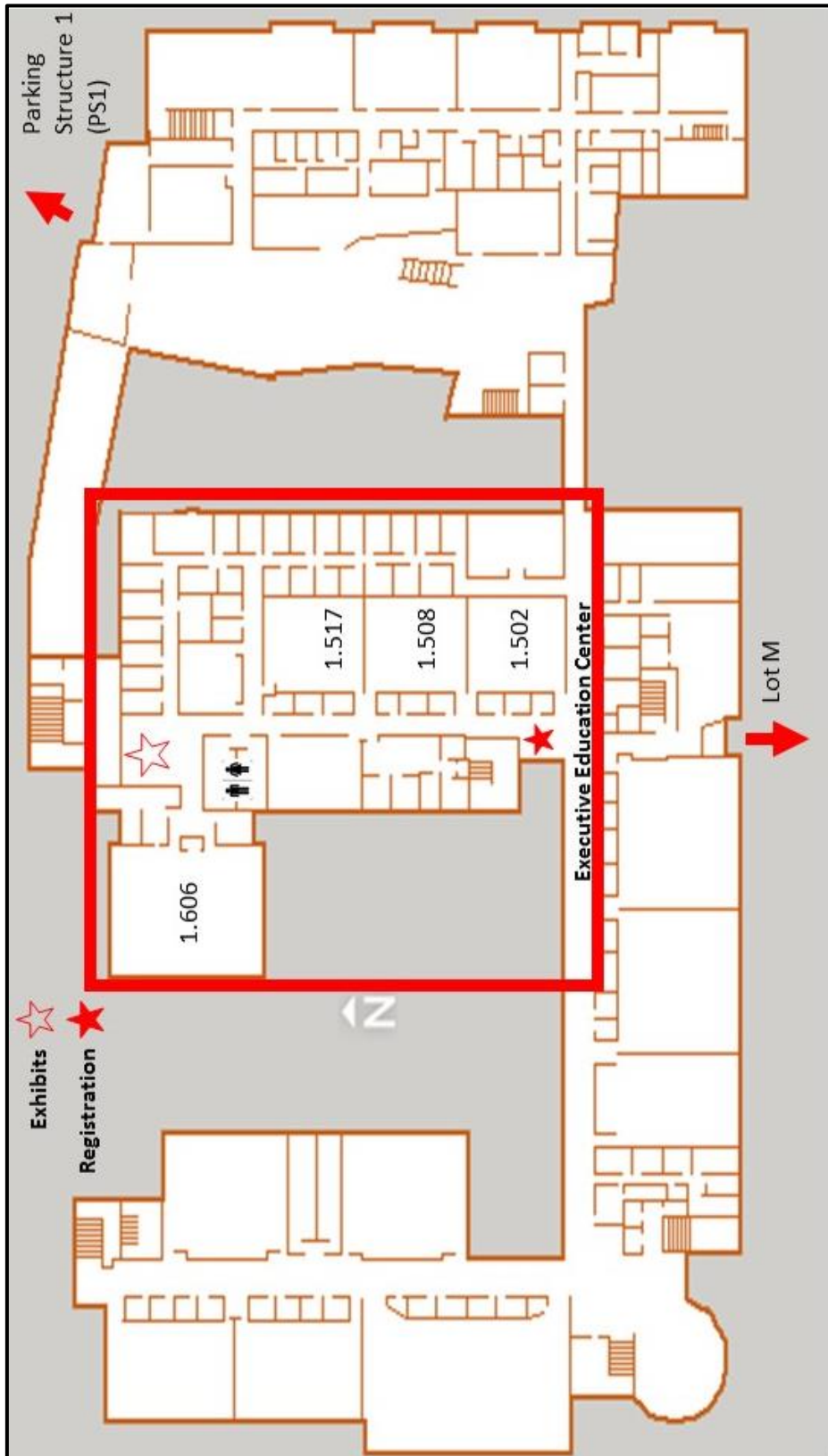
of scalar and vector quantities, whereas the correct and more easy to understand mathematics requires tensor constructs in most useful cases. Such restrictions are applicable for the most mundane cases often leaving students confused for example understanding stress and strain as six component vectors as opposed to introducing the undergraduate student to the correct and more readily understood tensor of rank two. This is not an add-on the already busy schedule of the engineering student and instructor, but is taught in lieu of the approach that is often used.

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