SPARKS

Daytona Section Newsletter
February 2022
https://r3.ieee.org/daytona/

SECTION MEETING
Engineering Week
Last week in February
More Information Forthcoming
Embry-Riddle Aeronautical University
Daytona Beach

CHAIR'S REPORT

Those of you who were not at the last section meeting missed two very interesting topics: actual fieldwork on autonomous driving vehicles at ERAU as well as an open discussion pertaining to the beginning of a Women in Engineering (WIE) affiliate group, maximizing section / student chapter relations, and suggestions on making activities more productive and accessible. Each of these topics could propel the section into furthering our impact and capability. Rebecca DeMarco is currently spearheading the WIE and student engagement efforts.

One of the suggestions put forth during the meeting was to change the monthly meeting time to Saturdays during the day, maybe late morning or early afternoon. I would like to hear other suggestions. Please feel free to email them to me, call me, or any of the ExCom members. If you are passionate about something and would like to present a proposal to the ExCom, please do not hesitate.

Traditionally, I believe the Daytona Section has been more of a spectator environment. It has also been very difficult to cater to dozens of interest areas. I would much rather see a dozen affinity groups gathering 2 to 24 times a year with actual perceived personal benefit to those engaging in the activities than low attendance of a general meeting that may or may not be

relevant to those who attend. Some of the most effective affinity groups in the US meet weekly/bi-weekly.

Take a moment and consider the following:

Why do I read/not read the newsletters?
Why do I attend/not attend the section meetings?

If you can say it in a sentence, we would like to hear your thoughts by visiting the section website: **https://r3.ieee.org/daytona/** and use the contact form. Those entries will be sent to me and will take less than a minute.

I look forward to seeing each of you at the ERAU Engineering Week event later this month.

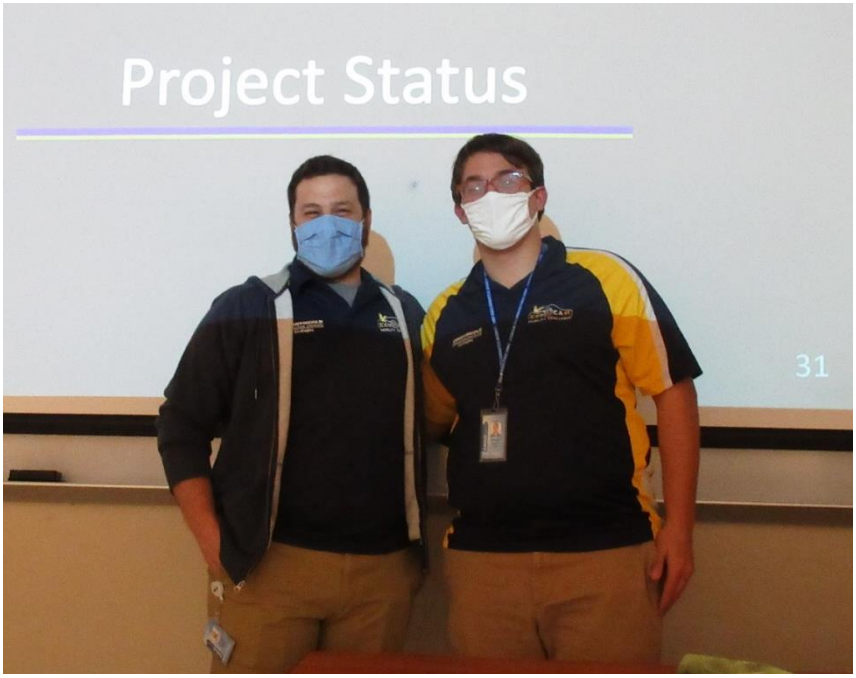
Shawn

JANUARY'S PRESENTATION

ECOCAR MOBILITY CHALLENGE

ERAU graduate students Devon Vail and Brandon Carrier gave a very interesting talk concerning the futuristic car technology development challenge sponsored by the Dept. of Energy, General Motors, and MathWorks. They described the modeling and testing work being performed on a 2019 Chevrolet test vehicle. The sensors and systems they are developing include adaptive cruise control, radar sensing systems, GPS system, internet communications, and lidar systems all in a vehicle with a 2.5 L engine plus two electric motors powered by a 300 volt battery. After an excellent presentation describing all this technology, we were taken to a garage area, where the test car was displayed. Thanks to Prof. Currier and his students for a most interesting evening.

The ERAU 2019 Chevrolet EcoCar



Student Presenters - Brandon Carrier and Devon Vail

FEBRUARY'S PROGRAM

As per our usual February meeting, it will be in conjunction with Embry-Riddle's Engineering Week program. The program is being finalized and not yet available for inclusion in the SPARKS Newsletter. The program's keynote speaker will be Paul Bevilaqua an Aeronautics Engineer at Lockheed Martin in California. The presentation will be in the last week of February. As soon as the date, time and location information is available, the Section's website will be updated and an eNotice will be sent.

2022 TOMOKA SCIENCE AND ENGINEERING FAIR

The Tomoka Science and Engineering Fair is held the beginning of each year and is sponsored by the Volusia County Schools. It's a student competition for science and engineering-based projects in various categories in both the junior division (middle school) and senior division (high school). Category winners are eligible for prizes, as well as the chance to advance to State and National competitions. In addition to the category awards, various organizations can participate and give special awards for projects related to their interests.

The Daytona Section gives a Special Award in both divisions to the project which incorporates the best application of computer science or engineering principles. The fair was held on January 29th at Stetson University. Section members David Defanti and Marty Oksenhorn were the judges for our Section's awards. Our award winners receive a check and a plaque. Our winners will also be invited to attend our April Section meeting as our guests.

The awards ceremony was held on February 1st at Mainland High school in Daytona Beach, Section editor Allan Jusko presented the awards to our winners.

Daytona Section Senior Division Award presented to Olivia Bisesi by Allan Jusko

Olivia Bisesi from Spruce Creek High School was selected for our Senior award for her project titled “How Efficient is an Autonomous Robot at Differentiating Objects Within Various Environments”

Daytona Section Junior Division Award presented to Troy Gingrich by Allan Jusko

Troy Gingrich from The Burns Science and Technology Charter School was selected for our Junior award for his project “What is the Strongest Shape in Bridge Design”

ANOTHER TALE FROM THE OLD PROFESSOR

ABSOLUTELY!

In a previous Tale, I challenged readers to define what the “ABS” printed on the panel of the Wheatstone bridge pictured indicated. It meant the bridge measured resistance in the “absolute” units of measure.

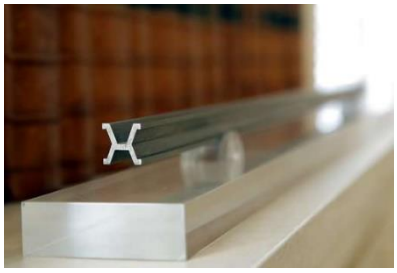
Not too long ago, that means when I was in college, our physics courses would use both, centimeter gram second, CGS, and meter kilogram second, MKS, units of measure. The connection between centimeter and meter was simply a factor of 100. For the gram-kilogram relationship, again it was a simple factor in this case of 1000. Time was the same for both CGS and MKS. Why use two different set of units? Probably to keep the numbers involved in calculations “under control”; that is not too big or too small. Really? Scientists and engineers can’t move a decimal point?

MKS and CGS were used for over 100 years up until the 1960’s when the International Standard, SI, units were widely adopted.

We have to go back and take a closer look at the MKS/CGS units. The primary standard for length was the distance between two scratch marks on a platinum-iridium bar kept at the Bureau International des Poids et Mesures, BIPM, near Paris. There was also a standard kilogram made of platinum-iridium. Replicas of the BIPM standard meter and kilogram were provided to

standards labs around the world including the National Bureau of Standards, now NIST, in the US. About every 40 years the replicas would be transported to Paris to be compared to the primary standard to be sure no one sawed off some of the valuable metal for profit. To insure this did not happen, the primary standards were kept in a well-guarded temperature- and humidity-controlled vault.

MKS and CGS were relative rather than absolute standards as they were keyed to a physical primary standard. It is my guess platinum-iridium alloy was used because of the alloy's resistance to corrosion so the standards would last forever which turned out to unnecessary since the need for the platinum-iridium standards didn't last forever. The platinum-iridium primary meter bar, no longer used, is in the BIPM's museum. The replica bars have probably been melted down and the platinum and iridium used for something more important.

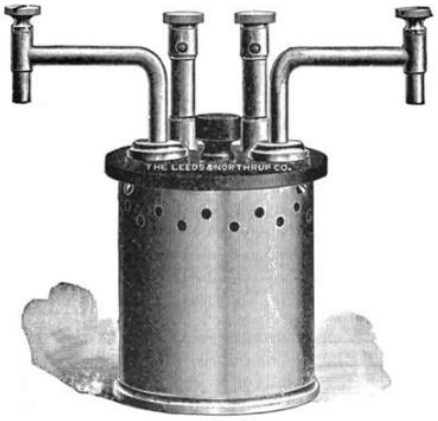


The standard meter of yesteryear now in the BIPM

The MKS and CGS units worked OK for Newtonian mechanics but when electricity showed up to the party, the MKS/CGS house of cards started to show signs of collapse. There were different units for electrostatic situations, electrostatic units, ESU, and electromagnetic units, EMU, when electrical charge was moving. This led to abcoulombs and statcoulombs, and abvolts and statvolts. Then it was discovered that electricity and magnetism were one and the same and Maxwell brought his equations to the party. There were 5 variants of his equations for different measurement systems. The conversion from one form of Maxwell's equations to another wasn't a matter of moving a decimal point but involved the speed of light, pi, and the permeability and permittivity of free space. That pulled the key card out from under the house of cards and it tumbled down.

Meters, kilograms and seconds survived the collapse and are the basis for the modern SI units. Meters, kilograms and seconds were joined by amperes for current, kelvins for temperature, moles for the amount of material, and candelas for luminous intensity for a total of 7 basic units. The standards that define the 7 basic units are based on universal constants which my favorite physics professor called "the constants of nature". Five constants of nature define SI units. They are the speed of light, Avogadro's number, the charge of an electron, and Boltzmann and Planck's constants.

The Wheatstone bridge referred to in the lead of this Tale measured resistance in absolute units; our modern ohm. Other possibilities at the time of the construction of the bridge were abohms and statohms, which were CGS units of resistance. There was also a host of ohm standards based on columns of mercury, lengths of steel wire, etc. These were always undergoing change as international scientific conferences tried to solve the weaknesses of these physical standards due to temperature variation, impure alloys etc.



A classic Leeds and Northrup lab standard ohm. Notice the 4 terminals. This allowed Kelvin 4 terminal sensing; a must for low resistance measurements. Notice also that in the center of the standard there is a hole for a thermometer to be inserted. The standard was often immersed in an oil bath to prevent self-heating of the resistor and maintain the calibration temperature.

The ohm is a derived unit meaning it doesn't need a primary standard. Since the voltage across a resistance, V, is V=IR, we can express R as R = I/V, with I in amperes, divided by V in volts, both of which are fundamental SI units. Therefore, we do not need a "standard ohm" kicking around in national standards labs. So, what is resistance in terms of the fundamental SI units? Resistance in ohms is $kg \cdot m^2 \cdot s^{-3} \cdot A^{-2}$.

I would guess that most electrical engineers would be surprised to learn that resistance is defined by mass, length, time and current.

Many of us "senior" scientists or engineers are accused of yearning for the good old days and to a certain extent that is true. Pre SI units from the good old days is not something I would like to see return.

Dr. Al Helfrick, a.k.a. The Old Professor

PE CORNER

The Steps to Professional Licensure, Part 3

Last month I discussed the experience necessary to qualify to apply to become a Professional Engineer. Now I'll address the last piece of the PE puzzle, the Principles and Practices of Engineering exam, also called the PE exam, and the final steps to licensure.

Recent Florida statute changes "decoupled" the experience requirement from qualifications to take the PE exam, removing the potential four-or-more-year time lag between graduation and taking the exam. That leaves only receiving an accredited degree and passing the FE as a hurdle to sitting for the PE, and paying the $375 exam fee, of course.

As I discussed previously, the FE exam is now exclusively computer based, given in a designated testing center, and no longer restricted to a twice-per-year schedule. The PE exam is moving that way as well. The exams are being converted to computer-based gradually, with all intended to be so by 2023. The schedule for exams being converted to computer-based is on the NCEES website. The electrical exams are now computer-based. More information may be found on the Board's website at https://fbpe.org/licensure/application-process/principles-practice-examination/

The PE exam is discipline specific, and most disciplines include sub-disciplines. For example, the Electrical and Computer exam includes three sub-disciplines: Computer Engineering, Electrical and Electronics, and Power. The NCEES website includes statistics for each sub-discipline exam, including the number of people who took it and the pass rate, both for first-time examinees and repeat examinees. This may be found at: http://ncees.org/engineering/pe/

The PE exam format is 8 hours long, given in two 4-hour sessions. Each session has 40 multiple choice questions and you must answer all of them. Like the FE exam, a reference book is provided for use during the exam. No other materials other than an approved calculator are allowed. Only certain calculators are allowed, a list of which is on the NCEES website. Exam grades are typically available about 7-10 days after the exam is taken. Examinees are notified by the Board if they pass, or provided information on retaking the exam if they don't. The Florida Board allows an examinee three tries to pass the exam. If the examinee fails three times, the board will typically require the examinee to take some classes at the college level in the appropriate subject matter before another attempt.

With the PE exam decoupled from the experience requirement, the potential licensee, having obtained a qualified degree, passed both exams, and obtained the required experience will submit all of this information to the Board, along with the required personal and professional references. The Board will then evaluate the submittal and if everything passes muster, the Board will certify that the licensee has completed all the requirements, and issue their license number.

To learn more about the examination and application process for the FE and PE exams go to the *Application Process* page under the *Licensure* section of FBPE's website at *www.fbpe.org*. Questions regarding licensure may be directed to the Board office at (850) 521-0500**.** Ask to speak to someone in the *Licensure* department.

Whether you are a PE looking to attain required CEHs, or an engineer looking to learn something new or keep current with the latest trend in the profession, IEEE has seminars that will meet your needs.

Art Nordlinger, PE, Senior Member

DAYTONA SECTION SHIRTS

We are pleased to offer Daytona Section polo shirts for our Section members. The shirts are embroidered with the IEEE Logo and DAYTONA SECTION on the left and your name and grade, if desired, on the right. The shirt is a high quality 5 oz, 65/35 poly/cotton pique in Royal Blue with white embroidery. Available in S - 2XL in men's as well as ladies' sizes. Price is $39, including tax, for S-XL size's, 2XL size is $3 additional.

For more information or to order shirts contact:
Allan Jusko, 386-671-3706 or a.jusko@ieee.org

FUTURE MEETING DATES

2022 Section meetings, depending on the coronavirus situation at the time:

Spring semester: Mar 24, Apr 28

DAYTONA SECTION SOCIAL MEDIA INFORMATION

Facebook: https://www.facebook.com/daytonaieee/

Twitter: @IEEEDaytona

LinkedIn: https://www.linkedin.com/company/ieee-daytona-section

ENGINEERING HUMOR

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