
COLLEGE OF ENGINEERING
BRADLEY DEPARTMENT OF ELECTRICAL
AND COMPUTER ENGINEERING
VIRGINIA TECH
ece
4805/4806/4304
Two-semester Major Design Experience (MDE)
and Other Design Experiences in ECE
POSTER EVENT
December 6, 2017

The Major Design Experience, is a culminating experience for undergraduate and graduate students during which they have the opportunity to combine all the technical, communication and teamwork skills that they have learned in one exciting and meaningful project. Whether a student's career interests lie in working for industry, continuing on for an advanced degree, or pursuing a job in our national labs, the capstone experience is an opportunity to define how they will impact the technical community or society in general.

After much success with combining a two-semester format with industry sponsorship, we are pleased to host our first-ever Spring/Fall section of the Major Design Experience Poster event. This parallel section was created out of feedback from Industry that they would also like Juniors to participate. Now second semester Junior students are joining this class and can consider an internship during the summer break. I think that you will agree with me that the result has been a wealth of inspiring and useful projects that have challenged our students to solve open-ended technical problems defined by our industry partners and guided by our faculty subject matter experts.

I was very pleased to have Professor of Practice Ken Schulz lead this effort this year partnering with Gino Manzo and Toby Meadows as this course grows in importance to our department. Ken, Gino, and Toby's combined experience and insight is invaluable to our students in preparing them for the next step in their engineering careers beyond graduation.

Congratulations to all the students for their dedicated efforts and thanks to our industry sponsors, instructors and subject matter experts for their tremendous support in this endeavor.

Luke Lester
Professor and Department Head
Bradley Department of ECE

December 6, 2017

Welcome and thank you for attending our fourth Major Design Experience (MDE) Poster Event! This also the very first Poster Event in our new Spring/Fall Cohort.

Today we are celebrating the achievements of over 40 students who have diligently worked on 12 diverse industry problems. We are pleased to showcase projects from our 4805/4806 Major Design Experience and three of Dr. Virgilio Centeno's ECE 4304 Design in Power Engineering Capstone projects.

The goal of this class is to provide students with a "real-life" industry project as part of their major design experience. Student teams work with sponsors, who are the customers. With advice from subject matter experts, they complete a meaningful engineering project. This project is managed exactly as if the students were just hired by a company and placed on an engineering team. Students are responsible for generating the project plan and then executing the plan. Throughout the two semesters, they are guided in technical areas by the subject matter experts, and mentored by the instructors in a host of professional and business skills, such as communication, teamwork, ethics, professionalism, company values, metrics, and new business acquisition. By working in teams, they develop leadership and group interpersonal skills and deal with schedule conflicts and meeting deliverables. Students are responsible for managing the customer relationship and solving the many real-life issues that undoubtedly will occur.

This program is only possible with the dedicated support from our sponsors and subject matter experts whom we whole-heartedly thank for their unwavering assistance. Thank you for engaging with our program and helping make our students more valuable.

We also want to acknowledge and thank Dr. Luke Lester for initiating this class at Virginia Tech and guiding this strategy to better prepare Virginia Tech ECE graduates for the work place. Thank you Dr. Lester! We also thank Dr. Virgilio Centeno and his students for joining this exciting poster event.

The growth in student enrollment, projects, and parallel sections has allowed us to utilize Toby Meadows and Gino Manzo in addition to myself as Professors providing the students industry perspective as they navigate their projects. Among the three of us we have over 100 years of industry experience as practicing engineers and leaders in our respective companies.

Finally, we want to thank our students, who were brave enough to try something new. Stepping out of your comfort zone is always a valuable learning experience. We wish you all the best as you pursue your aspirations.

Sincerely,

Kenneth R. Schulz
Two-Semester Major Design Experience Professor of Practice

"Senior Design has been one of the most beneficial classes in teaching me how to conduct myself as a professional and succeed in the workplace."

"I learned how to professionally manage an engineering project from the proposal to final product stages."

TODAY'S PROGRAM

11:30 AM—Noon	**Guests Arrive**
Noon-12:40PM	**Welcome**—Prof. Schulz **Other Remarks** **Team Presentations**
12:40—2:00 PM	**Lunch**, Review Posters
2:00 PM	**Best Paper Awards**
2:30 PM	**Adjourn**

All guests are requested
to vote for Best Poster
Every vote counts

"This class is a great industry-oriented experience, which gives us opportunities to develop our technical and professional skills."

"This project has been a lot of fun. It's been great and inspiring to work with such a diverse—but also very driven and talented—group of people."

"This class helps students obtain the tools, knowledge, and experience they need before they head out into the workforce."

OUR SPONSORS

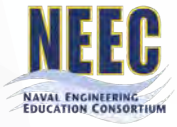
With gratitude and appreciation for your dedicated support

Army Night Vision Lab

Qualcomm

General Motors & Virginia Tech Transportation Institute

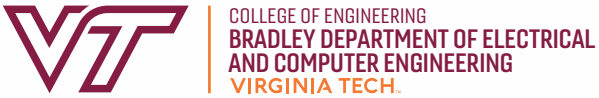
United Technologies



Naval Engineering Education Consortium

Virginia Tech College of Architecture and Urban Studies

QRC Technologies



Virginia Tech ECE

PROJECT LEADERSHIP

This class is only possible because of the commitment, dedication and spirit of the following Customers and Subject Matter Experts. **Thank you!**

SPONSOR	CUSTOMER	PROJECT	SUBJECT MATTER EXPERT
Army Night Vision Lab, Fort Belvoir, VA	Dong Ha	Energy Harvesting and Low Power Electronics	Dong Ha
Army Night Vision Lab, Fort Belvoir, VA	Dong Ha	Read Out Integrated Circuit Design	Dong Ha
General Motors, Detroit, MI with VTTI*	Zac Doerzaph (VTTI), Reginald Viray (VTTI), Leslie Harwood (VTTI), Duane Carper (GM)	Improving Relative Positioning for Advanced Vehicles	Ryan Gerdes
Naval Engineering Education Consortium, NAVSEA, Washington Navy Yard, DC	Hardus Odendaal	Arc Sensor	Hardus Odendaal
Naval Engineering Education Consortium, NAVSEA, Washington Navy Yard, DC	Hardus Odendaal	DAQ Power Supply	Hardus Odendaal
Naval Engineering Education Consortium, NAVSEA, Washington Navy Yard, DC	Hardus Odendaal	High Voltage / High Current Switch	Hardus Odendaal
QRC Technologies, Fredericksburg,VA	Charles Cushing	Quick Energy Detection	Joseph Ernst
Qualcomm, San Diego, CA	Dilip Gopalakrishna and Abhijit Khobare	Building a Model for Intelligent Parking in an Autonomous Vehicle	Mark Jones
United Technologies, Vergennes, VT	Christopher Fitzhugh	Algorithms for Cognitive Radios	Harpreet S. Dhillon
Virginia Tech College of Architecture and Urban Studies, Blacksburg, VA	FutureHaus	FutureHaus	Virgilio Centeno
Virginia Tech ECE, Blacksburg, VA	Virgilio Centeno	Automotive Wireless Charging	Virgilio Centeno
Virginia Tech ECE, Blacksburg, VA	Virgilio Centeno	Sun Tracking System for Solar Thermal Satellite Dish	Virgilio Centeno

*Virginia Tech Transportation Institute

GUEST SPEAKERS
in order of appearance

In addition to our project sponsors and subject matter experts, there were many others that significantly contributed to the success of this class. We want to take this opportunity to express our deep-felt appreciation and thanks for their contributions.

Ms. Xu Qian
LIDOS
Program Management, Resume Reviews, Mentoring

Dr. William Baumann
Virginia Tech – ECE
Design Studio Safety Training and Material Procurement Instruction

Ms. Carin Miller
Thomas Horstemeyer Intellectual Property Attorneys

Mr. Michael Miller
Virginia Tech – Intellectual Properties
Innovation and Intellectual Property Management

Mr. Toby Meadows
NAVAIR Leadership

PROJECT TEAMS

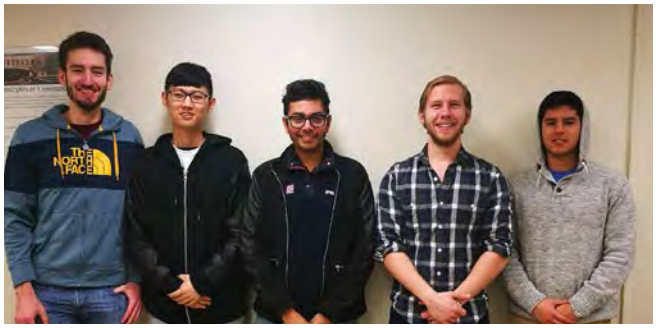
Energy Harvesting and Low Power Electronics

Project Sponsor:
Army Night Vision Lab
Dong Ha

SME:
Dong Ha

CHALLENGE:

Harvest solar energy, thermal energy,
and kinetic energy from walking to charge batteries.



Austin Sharlette, Youming Qin, Upal Patel, Jourdan Dubea, Cristhian Alcocer

Cristhian Alcocer

(Fairfax, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To be a project manager of a renewable energy power systems design firm.

CLASS COMMENT:
This class teaches valuable lessons about the professional world that will prepare you for your future career.

Jourdan Dubea

(New Orleans, LA)
B.S. Electrical Engineering

ASPIRATIONS:
To work interfacing cutting edge hardware and software.

CLASS COMMENT:
This class has given me both valuable professional experience as well as a better opportunity for jobs during/after college.

Upal Patel

(Vadodara, India)
B.S. Electrical Engineering

ASPIRATIONS:
Make the world a better place to live with the engineering techniques I learn.

CLASS COMMENT:
This class helped me with real world problems, and also gave me industry-like experience.

Youming Qin

(Xinxiang, China)
B.S. Electrical Engineering

ASPIRATIONS:
To be a project manager for drone-based projects.

CLASS COMMENT:
This class gives me real teamwork experience, and I learned non-technical things that are not taught in other classes.

Austin Sharlette

(Williamsburg, VA)
B.S. Electrical Engineering

ASPIRATIONS:
I aspire to continue my education in the electrical engineering field and research better energy storage technology.

CLASS COMMENT:
I am grateful to have been a part of this course because of the insight Professors Manzo and Schulz provided from their industry experiences.

Read Out Integrated Circuit Design

Project Sponsor:
Army Night Vision Lab
Dong Ha

SME:
Dong Ha

CHALLENGE:

To analyze and improve existing ROIC technology for night vision purposes.

Amanuel Alemu, Alberto Olivares, Addisu Jimilu

Amanuel Alemu

(Debre Zeit, Ethiopia)
B.S. Electrical Engineering

ASPIRATIONS:
I want to use my knowledge of engineering to help the community.

CLASS COMMENT:
Communication is key for accomplishing tasks.

Alberto Olivares

(Caracas, Venezuela)
B. S. Electrical Engineering

ASPIRATIONS:
To work with power systems and power control.

CLASS COMMENT:
While cooperation is important, one must not underestimate the value of communication.

Addisu Jimilu

(Addis Ababa, Ethiopia)
B. S. Electrical Engineering

ASPIRATIONS:
The reason I want to become an electrical engineer is because of the platform it gives me to make a difference.

CLASS COMMENT:
I have learned many valuable real-world tactics that will help me land my dream job in the future.

Improving Relative Positioning for Advanced Vehicles

Project Sponsor:
General Motors/VTTI
Zac Doerzaph (VTTI), Reginald Viray (VTTI), Leslie Harwood (VTTI), Duane Carper (GM)

SME:
Ryan Gerdes

CHALLENGE:

Using four GPS receivers, four GPS loggers, and one Raspberry Pi to improve localization of a moving vehicle.

Kaijian Li, Charles Duncan, Chris Minor, Eduardo Davila, Rushabh Shah

Eduardo Davila

(Guaynabo, Puerto Rico)
B.S. Computer Engineering

ASPIRATIONS:
High-level programming in machine learning, artificial intelligence, autonomous vehicles, or robotics.

CLASS COMMENT:
I learned how to manage coordinating with different groups of people to come together for one big project.

Charles Duncan

(Raleigh, NC)
B.S. Electrical Engineering

ASPIRATIONS:
To become a second lieutenant in the U.S. Army and go to the Army War College.

CLASS COMMENT:
Really enjoyed the realistic nature. Good preparation for the real world and team environment.

Kaijian Li

(Hefei, Anhui, China)
B.S. Electrical Engineering

ASPIRATIONS:
Graduate school for deeper learning in signal processing and communication.

CLASS COMMENT:
Great cooperation with my four buddies!

Chris Minor

(Mechanicsville, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To work as an electrical engineer in the aviation industry on avionics systems.

CLASS COMMENT:
I learned how to professionally manage an engineering project from the proposal to final product stages.

Rushabh Shah

(Mumbai, India)
B.S. Electrical Engineering

ASPIRATIONS:
Work in the industry as an electrical engineer designing ICs.

CLASS COMMENT:
This class has given me good insight on workplace projects and teamwork.

Arc Sensor

Project Sponsor:
Naval Engineering Education Consortium
Willem G. (Hardus) Odendaal

SME:
Willem G. (Hardus) Odendaal

CHALLENGE:

Our team was tasked with designing and building a system that could quantify the magnitude and duration of an arc flash.

Kevin Arrington, Eric Chandler, Kevin Tan

Kevin Arrington

(Statesville, NC)
B.S. Electrical Engineering

ASPIRATIONS:
I am planning to work for the Naval Surface Warfare Center Dahlgren Division after graduation.

CLASS COMMENT:
Senior Design has been one of the most beneficial classes in teaching me how to conduct myself as a professional and succeed in the workplace.

Eric Chandler

(Richmond, VA)
B.S. Computer Engineering

ASPIRATIONS:
I am planning to work in robotics for a defense contractor after graduation.

CLASS COMMENT:
I have learned a great deal of real-world applications that I never could have learned in the classroom.

Kevin Tan

(Manassas Park, VA)
B.S. Electrical Engineering

ASPIRATIONS:
I plan to seek my masters in electrical engineering.

CLASS COMMENT:
Everyone worked very hard, and I learned a lot of skills that I did not get from typical classes.

DAQ Power Supply

Project Sponsor:
Naval Engineering Education Consortium
Willem G. (Hardus) Odendaal

SME:
Willem G. (Hardus) Odendaal

CHALLENGE:

To design a circuit that siphons energy from a high voltage system and steps it down to charge a battery.

Nicholas Fernandez, Ben Swartz, Samantha Pascual

Nicholas Fernandez

(Alpharetta, GA)
B.S. Computer Engineering

ASPIRATIONS:
To become a high-level engineer for a Department of Defense contractor.

CLASS COMMENT:
Great experience of a project from RFP to deliverables.

Samantha Pascual

(Aldie, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To engineer products that help save people's lives.

CLASS COMMENT:
This class helps students obtain the tools, knowledge, and experience they need before they head out into the workforce.

Ben Swartz

(Manassas, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To design small-scale, sustainable energy solutions for residential and commercial applications.

CLASS COMMENT:
This class presents a real-world design challenge. It is an enriching, educational experience.

High Voltage / High Current Switch

Project Sponsor:
Naval Engineering Education Consortium
Willem G. (Hardus) Odendaal

SME:
Willem G. (Hardus) Odendaal

CHALLENGE:

Design a high-voltage high current switch.

Keith Tiemann, Brian Mathis, Tyler Banks

Tyler Banks

(Centerville, OH)
B.S. Electrical Engineering

ASPIRATIONS:
Upon graduating, I plan on going into industry and developing robotics.

CLASS COMMENT:
This class has provided me with great insight into teamwork.

Brian Mathis

(Midlothian, VA)
B.S. Electrical Engineering

ASPIRATIONS:
After graduating, I intend to work in the electrical or computer hardware engineering fields.

CLASS COMMENT:
This has been a great opportunity to experience the design process.

Keith Tiemann

(Washington, DC)
B.S. Electrical Engineering
B.S. Computer Engineering

ASPIRATIONS:
I plan on relaxing, having a family, and tinkering with robotics.

CLASS COMMENT:
Two major lessons learned: Never accept failure, and go hiking more.

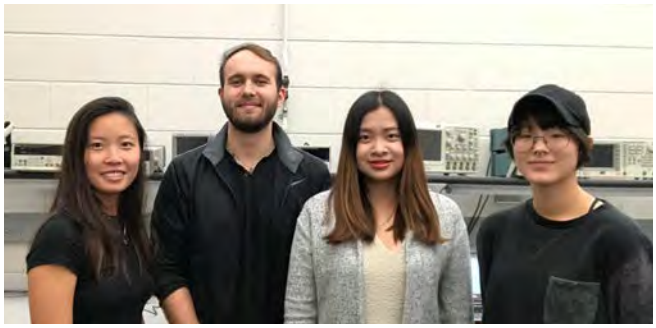
Quick Energy Detection

Project Sponsor:
QRC Technologies
Charles Cushing

SME:
Joseph Ernst

CHALLENGE:

To develop software solutions that will analyze the characteristics of RF signals within a software-defined radio environment.



Thanh Nguyen, Ryan Herzog, Alice Zheng, Fiona Kim

Ryan Herzog

(Manassas Park, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To engineer and develop solutions that will improve people's lives, and gain the experience to be an expert in my career field.

CLASS COMMENT:
Learning to work as a team towards a goal and gaining an introduction into the professional world are very important aspects that this class introduces.

Thanh Nguyen

(Ho Chi Minh City, Vietnam)
B.S. Electrical Engineering

ASPIRATIONS:
To be an expert in digital hardware design and engineering education.

CLASS COMMENT:
This class is a great industry-oriented experience, which gives us opportunities to develop our technical and professional skills.

Fiona Kim

(Annandale, VA)
B.S. Computer Engineering

ASPIRATIONS:
To be a software engineer that prioritizes UX/UI.

CLASS COMMENT:
This class has encouraged me to take on more of a leadership role down my career path.

Alice Zheng

(Centreville, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To produce an actual technology product from a professional engineer's perspective.

CLASS COMMENT:
This class has provided a chance for me to develop and master problem solving and team work skills.

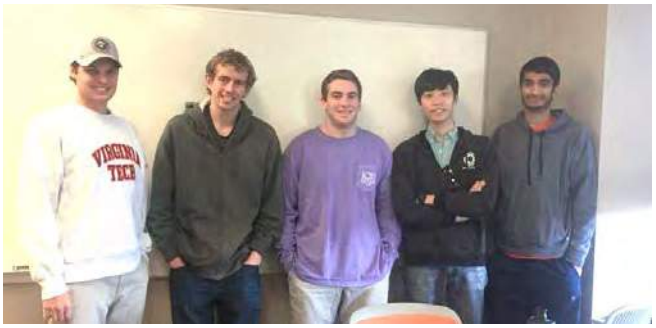
Building a Model for Intelligent Parking in an Autonomous Vehicle

Project Sponsor:
Qualcomm
Dilip Gopalakrishna
and Abhijit Khobare

SME:
Mark Jones

CHALLENGE:

Develop navigation software that controls an autonomous rover through a model parking lot and allows it to self-park.



Jake Gleusner, Cameron Hellstern, Jake O'Neil,
Theo Long, Dev Lakhia

Jake Gleusner

(Cold Spring Harbor, NY)
B.S. Electrical Engineering

ASPIRATIONS:
To start out as a design engineer, then become a project engineer/manager.

CLASS COMMENT:
I enjoy being able to build an actual project rather than having to take tests on paper like other classes.

Cameron Hellstern

(Herndon, VA)
B.S. Computer Engineering

ASPIRATIONS:
Work for a small-to-medium sized company focusing on embedded systems development.

CLASS COMMENT:
The companies that were available to work with were very impressive.

Dev Lakhia

(Centreville, VA)
B.S. Computer Engineering

ASPIRATIONS:
Start a farm and become a teacher in math or philosophy.

CLASS COMMENT:
The class gives great real-world application to the theory taught in school.

Theo Long

(Canton, China)
B.S. Computer Engineering

ASPIRATIONS:
Research in wearable robotics and exoskeleton.

CLASS COMMENT:
This class is just like the real-world prototyping process.

Jake O'Neill

(Annapolis, MD)
B.S. Electrical Engineering

ASPIRATIONS:
To become team lead within a company that works with wireless communications.

CLASS COMMENT:
I learned many aspects of working with a team that I will use in the future.

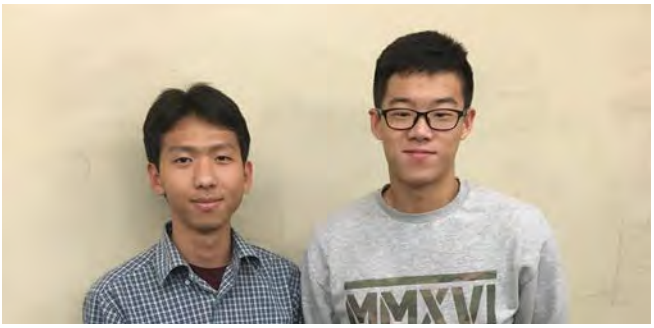
Algorithms for Cognitive Radios

Project Sponsor:
United Technologies
Christopher Fitzhugh

SME:
Harpreet Dhillon

CHALLENGE:

An interference avoidance algorithm is needed in response to a future operation of the WAIC devices in the Radio Altimeter bandwidth, which is 4.2–4.4 GHz.



Long Huang, Jiamin Xie

Long Huang

(Falls Church, VA)
B.S. Electrical Engineering

ASPIRATIONS:
Become an RF engineer/researcher and a pioneer in the new age of wireless technology.

CLASS COMMENT:
This class is a great opportunity for us to apply what we've learned to an actual design

Jiamin Xie

(Shanghai, China)
B.S. Electrical Engineering

ASPIRATIONS:
Contributing to the cutting-edge research on the future technologies such as 5G, AI, and Internet of Things, and bringing them to daily life.

CLASS COMMENT:
The class encourages us to adapt professional engineering work outside of the school. P.S. 8 am class was fantastic!

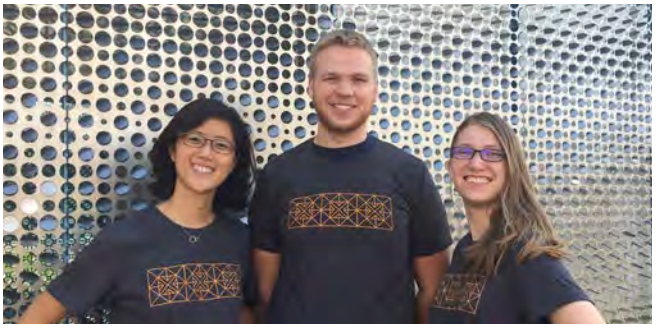
FutureHAUS

Project Sponsor:
Virginia Tech
College of Architecture
and Urban Studies
Joseph Wheeler, Robert Vance

SME:
Virgilio Centeno

CHALLENGE:

Working with the FutureHAUS team to develop their electrical systems, including electrical wiring, solar panel layout, load management strategies, device testing, and other project requirements.



Chae Won (Jennifer) Kim, James Morgan, Michaela Goldammer

Michaela Goldammer

(Blacksburg, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To work on the design and development of more efficient and sustainable power systems in aircraft.

CLASS COMMENT:
This has been a fun opportunity to work with people from all kinds of backgrounds as we innovate house design.

Chae Won (Jennifer) Kim

(Leesburg, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To become a power systems engineer and work with renewable energy and sustainable power systems.

CLASS COMMENT:
This project has been a lot of fun. It's been great and inspiring to work with such a diverse—but also very driven and talented—group of people.

James Morgan

(Herndon, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To become an electrical engineer specializing in communications.

CLASS COMMENT:
This opportunity has given me the chance to work with a large, multidisciplinary team and apply my education in a variety of practical ways.

Automotive Wireless Charging

Project Sponsor:
Virginia Tech ECE
Virgilio Centeno

SME:
Virgilio Centeno

CHALLENGE:

Design and implement a scaled version of a wireless charging system for automotive applications. The team aims to prove its operation for stationary and moving conditions.

Sean Hurrell, Jordan Jackson, Austin Sharlette, Andrew Wise

Sean Hurrell

(Sterling, VA)
B.S. Electrical Engineering

ASPIRATIONS:
I will be working in the defense industry to hopefully make a difference in the world.

CLASS COMMENT:
The class challenges you to apply everything you have learned here at Virginia Tech.

Austin Sharlette

(Williamsburg, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To apply to graduate school and further my education as an electrical engineer.

CLASS COMMENT:
I am excited to be learning about wireless charging and know the impact that it will have on the world's future.

Jordan Jackson

(Randallstown, MD)
B.S. Electrical Engineering

ASPIRATIONS:
To become an electrical engineering project manager in the next 10-15 years.

CLASS COMMENT:
It has been fun to gain hands-on experience with this senior design team project.

Andrew Wise

(Alexandria, VA)
B.S. Electrical Engineering

ASPIRATIONS:
Commissioning into the U.S. Navy as a cryptology officer. I hope to work with cyber security as it pertains to power systems.

CLASS COMMENT:
This class has been an enjoyable exercise in hands-on building of power devices.

Sun Tracking System for Solar Thermal Satellite Dish

Project Sponsor:
Virginia Tech ECE
Virgilio Centeno

SME:
Virgilio Centeno

CHALLENGE:

Design and implement a reliable camera-based sun tracking system for a solar thermal application. The system tracks the sun and moves the thermal dish accordingly during the day and returns to its start position at the end of the day.

Brian Kit Tong, Ryan Lei

Ryan Lei

(Easton, CT)
B.S. Electrical Engineering

ASPIRATIONS:
Wanting to learn more about the Raspberry Pi, OpenCV, and circuit PCB design.

CLASS COMMENT:
Currently taking this project as undergraduate research.

Brian Kit Tong

(Burke, VA)
B.S. Electrical Engineering

ASPIRATIONS:
To involve myself in the advancement of renewable energy and learn about the Raspberry Pi.

CLASS COMMENT:
Currently taking this project as undergraduate research.

Many people contributed to this program that we want to acknowledge and thank:

Luke Lester
for his vision and continued unyielding support to make this class available for students.

Gino Manzo
for being our assistant instructor, mentoring teams, and making the class better.

Mary Brewer, Nicole Gholston, Kimberly Johnston, JoAnna Lewis, Susan Broniak, David Padilla, Minerva Sanabria, Alice Quesenberry, Jamie De La Ree, and Paul Plassmann
for setting up information sessions and guiding students into the class.

William Baumann
Bob Lineberry
Kenny Jarles
for allowing us complete access to the design studio, conference room, and providing assistance to students in need.

Karin Clark
Deborah Hamilton
Lisa Young
for being our partners and diligently working to secure us industry sponsorships.

Arthur Ball
for integrating the Masters students into our class and providing them ongoing guidance.

Kim Medley
for ordering our materials, and helping us solve supplier issues.

Kathy Atkins, Melanie Gilmore
for providing financial guidance and support.

Roderick DeHart
John Harris
Brandon Russell
for solving our many IT issues, and printing the poster papers in quick time.

Bianca Norton
and the Virginia Tech Inn Staff
for helping plan, cater and secure all arrangements for the Poster Paper Event.

Special thanks:
Mohammad Al-Mamun
Teaching Assistant specializing in Semiconductor Projects.
Provided excellent safety, tool, semiconductor processing, and mask design training.

Special thanks:
Victor Sung
Robin Yang
Corey Rhodes
Railgun projects Teaching Assistants.