Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

GM

Project Number: 1

Project Title: IEEE Robot – Embedded Team

SME: Arthur Ball

Customer POC: Chengliang Lu

Project Summary:

Embedded Team - Create an embedded system that integrates sensors, motors, and any peripheral necessary to complete the competition specifications as well as provide an API to be used by the software team. Assist in the design of the overall robot and develop solutions to the competition stages. You must collaborate with the other IEEE Robotics Team to design and integrate a complete robot.

Software Systems

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

GM

Project Number: 2

Project Title: IEEE Robot – Electrical Team

SME: Arthur Ball

Customer POC: Chengliang Lu

Project Summary:

Electrical Team - Design and implement an electrical subsystem to provide the various components of the robot with power. Assist in the design of the overall robot and develop solutions to the competition stages. You must collaborate with the other IEEE Robotics Team to design and integrate a complete robot.

CONTROLS, ROBOTICS AND AUTONOMY, ENERGY & POWER ELECTRONICS

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Collins Aerospace

Project Number: 3

Project Title: Avionics Transponder RF Signal Analyzer

SME:Joseph Gaeddert

Customer POC:
Chris Gili / chris.gili@collins.com/ 321-308-3544

Project Summary:

The Traffic Surveillance department at Collins would like a device to record transponder signals on an aircraft while it is flying. Troubleshooting efforts would be greatly enhanced if engineers were able to capture not only whether or not a response was detected, but what the actual power levels of the responses are. The project's goal is to build a self-contained data recorder to capture 1030 / 1090 MHz XPDR / ACAS signals.

Software Systems, Communications, RF

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Collins Aerospace

Project Number: 4

Project Title: **Universal Power Amplifier test controller (based on a Raspberry PI)**

SME:Peter Han

Customer POC:
George Cooley / george.cooley@collins.com / 319-263-3368

Project Summary:

The low cost controller will be able to interface with all of our test equipment to run standard tests that are currently being done by hand. The idea is to make the platform low cost and expandable. Over time we can expand drivers to various pieces of equipment and models as time permits (a great activity for interns or engineers that are on general time). Also various tests can be added. Using a low cost platform will make it easy to replicate and expand.

Software Systems, Power Electronics

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Collins Aerospace

Project Number: 5

Project Title: **HF antenna controller**

SME: Manteghi Majid

Customer POC:
George Cooley / george.cooley@collins.com / 319-263-3368

Project Summary:

Currently most controllers have control cables that must be decoupled with the antenna system. An RF-based system using standard Bluetooth or WiFi interfaces can be used to control variable inductors, variable capacitors, switches and impedance transformers and phasing lines. This will allow many possibilities such as tuning the antenna structure to resonance, switching polarization, and switching direction.

RF, Antennas, Communications

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Collins Aerospace

Project Number: 6

Project Title: **Self-Powered Aircraft Engine Devices Using Temperature Differential Between Inside and outside**

SME:Dong Ha

Customer POC:
Magdi Essawy / magdi.essawy@collins.com / 952-892-4331

Project Summary:

The ability to provide electric power to sensors, electronics, and communication devices (such as RF/wireless communications) operating in high temperature high pressure harsh environment inside an aircraft engine is so critical to the ability to measure and control engine parameters for best performance. In this project a method will be developed and tested to demonstrate a concept of using a very high temperature differential between the inside and outside of the engine to generate electrical power needed to supply engine sensors and other engine control and communication devices. Temperature inside the engine goes up to thousands of degrees C, and outside air temperature is about -55 degrees C. This large temperature differential will be used to drive electric current through a thermoelectric device using the Seebeck effect. This electric current will be consequently used to supply a sensor or electronic device inside the engine with the required power either directly or through storing power in storage devices such as capacitor banks. In this project the team will build a device prototype and test it to demonstrate and measure the electric power provided.

Power Electronics, Micro-Nano Systems, Software Systems

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Texas Instruments

Project Number: 7

Project Title: DIY Robotics Kit

SME: Peter Han

Customer POC: Mark Easley, measley@ti.com

Project Summary:

This project will utilize the TI-RSLK robot as a model to create a custom robotics experience utilizing the existing hardware or by creating a custom, low cost kit for users looking to start in robotics. The project will require a mix of hardware and software skills to design the PCB and out of box software examples and will also need creativity around how to bring new features and invent new use cases for the design. The team can choose to have the robot make use of different styles of programming including Energia (Arduino), MicroPython, RTOS, and more. The robot can incorporate a variety of sensor inputs or wireless communication to increase the capabilities.

Software Systems, CONTROLS, ROBOTICS AND AUTONOMY,

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

MITRE

Project Number: 8

Project Title: A new method to detect symbol constellation by digital communications receivers

SME: William "Chris" Headley

Customer POC: DDr. Datta Dattatreya

Project Summary:

In commercial radio receivers, a user selects a band (AM or FM) and scans the frequency range to select a desired station. The radio then uses signal parameters to lock-on to the selected station. We are investigating a new and better way to 'tune in'. The new method automatically detects the way digital data symbols are encoded into radio transmissions. This new method extends a technique published by K. Mackenthunthat was originally designed to estimate only the phase shift of an m-aryPSK received signal. With the new method, students will apply the Mackenthuntechnique to each of the digitally encoded data symbols in a PSK constellation. Next, the students will distinguish between groups of symbols by amplitude then estimate the relative amplitude and frequency of the symbols. Finally, the students will compile and compare all the symbol locations in the Amplitude and Phase Shift Keying (APSK) constellation. This new method is expected to provide superior performance for a wider range of signal to noise ratios than current methods.

Communications and Networking, RF and Microwave, Software Systems

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Wiley|Wilson®
Constant Progress

U.S. citizenship required

Project Number: 9

Project Title: Zero Energy Data Center

SME: Jaime De La Ree

Customer POC: Walt Mendenhal, Steve Bowman, Mark Adkinson, Dan Morton

Project Summary:

A Client currently operates several mission critical data centers. The electrical distribution systems within these data centers are near end-of-life, will not support future load growth, and do not meet the current availability requirement of the mission. The Client would like to construct a new data center, which will consolidate equipment from the existing data centers, meet the required electrical availability of six nines (99.9999%), and consume zero or nearly-zero net energy. As the selected engineering firm, you will be responsible for researching and recommending a topology for the electrical distribution system of the new data center which will achieve 32 seconds or less downtime per year, as well as, technologies for renewable energy integration and energy storage which will achieve zero or nearly-zero net energy consumption.

ENERGY & POWER ELECTRONICS

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

NAVAIR

Project Number: 10

Project Title: Drone 1 Object Detection

SME: tbd

Customer POC: Michael Sparr

Project Summary: Create a system that automates aerial reconnaissance. The system should identify a set of shapes corresponding to various target types and provide real-time tracking of target location and range . The system must be able to identify its own position (latitude, longitude, and altitude) as well be able to operate in tandem with another drone to maintain no less than 120 degrees of separation. All drone flight and target data shall be reported to a local ground station for analysis. Drone 1 shall identify target and report target location. Drone 2 will retrieve identified target.

CONTROLS, ROBOTICS AND AUTONOMY (CRA)

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

NAVAIR

Project Number: 11

Project Title: Drone 2 Retrieval

SME: tbd

Customer POC: Thomas Newhart

Project Summary: Create a system that automates aerial reconnaissance. The system should identify a set of shapes corresponding to various target types and provide real-time tracking of target location and range . The system must be able to identify its own position (latitude, longitude, and altitude) as well be able to operate in tandem with another drone to maintain no less than 120 degrees of separation. All drone flight and target data shall be reported to a local ground station for analysis. Drone 1 shall identify target and report target location. Drone 2 will retreive identified target.

CONTROLS, ROBOTICS AND AUTONOMY (CRA)

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

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Project Sponsor:

VIRGINIA TECH™

ECE

Project Number: 12

Project Title: ECE Inventory

SME: Paul Plassmann

Customer POC: Paul Plassmann

Project Summary:

This goal of this project is the design and development of a mobile inventory database system for the ECE Department. The Department is currently responsible to the state of Virginia for managing over 5,000 items purchased on behalf of its behalf. An efficient mechanism for tracking this inventory would result in significant manpower savings and would allow the Department to more easily meet its audit requirements.

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

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Project Sponsor:

Altria

Project Number: 13 Project Title: tbd

SME: tbd Customer POC: tbd

Project Summary:

tbd

tbd

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

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Project Sponsor:

TMEIC

Project Number: 14

Project Title: TMEIC Inertial Measurement Unit (IMU) Prototype

SME: tbd

Customer POC: Matt Mandros, Thomas Tainer

Project Summary:

Develop an IMU prototype that is essentially an off-the-shelf IMU that is repackaged with the fieldbus and power converters required to support an industrial interface, all combined in a sealed enclosure. The IMU shall have a mechanism to update the algorithms used to process the raw IMU data. IMU shall operate on an Ethernet-based protocol. Power supply shall be 24 volts. IMU shall be capable of operating at minimum power -on shock load of 30G but 100Gs or higher is desired. The IMU is required to have a 3 axis accelerometer and gyroscope. Gyroscope, accelerometer and other system requirements are listed in RFP.

Controls, Embedded Systems, Power, Algorithms

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

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Project Sponsor:

SASM

Project Number: 15

Project Title: Project Messenger- System of Transceivers

SME: tbd

Customer POC: Salma Mahmoud, smahmou4@gmu.edu

Project Summary:

Design and prototype a system of transceivers that track locations of devices using a localized GPS, send and receive messages amongst each other, and store location and messaging data into a cloud network. This system will utilize the skills learned for software systems, networking and communication as well as localization techniques. System hardware should be low cost to allow for mass production, have low power consumption, very durable, and have wireless capabilities.

Networking, Communications, Transceivers

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

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Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

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Project Sponsor:

BAE SYSTEMS

U.S. citizenship required

Project Number: 16

Project Title: Processing algorithms for Hazard Avoidance on an FPGA

SME: tbd

Customer POC: Richard Berger, richard.w.berger@baesystems.com

Project Summary:

Identify and demonstrate implementations of the required hazard avoidance algorithms on the Xilinx ZYNQ Z-7010 System-on-chip FPGA. Document the steps taken along the way, to include the trades of which algorithms to implement, how to measure the results (accuracy, latency to issue avoidance procedures, etc.) , and the result in terms of performance, power dissipation, utilized FPGA resources, and lines of software code required for each implementation.

Software Systems, FPGA Algorithms

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

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Project Sponsor:

inmarsat

1 of 2 will be executed

Project Number: 17

Project Title: Develop a Spread Spectrum Modem

SME: Alan Michaels

Customer POC: Wendy Votaw wendy.votaw@inmarsatgov.com

Project Summary:

Develop a Spread Spectrum Modem, model the MODEM in MATLAB / Simulink, generate performance predictions in the modeling environment, implement the Modem model in VHDL on a Software Defined Radio (SDR) platform, and validate the performance of the waveform on the SDR. The modem will need to include framing, Forward Error Correction, and Direct Sequence Spread Spectrum techniques to include orthogonal codes for multiple access features.

EE, Communications, MATLAB, VHDL, Software Defined Radio

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

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Project Sponsor:

inmarsat

1 of 2 will be executed

Project Number: 18

Project Title: Develop an Enterprise Network Management Systems

SME: tbd

Customer POC: Wendy Votaw wendy.votaw@inmarsatgov.com

Project Summary:

Develop an Enterprise Network Management System (ENMS) software tool that provides end-to-end monitoring, reporting, and data analytics for a satellite communications network. The ENMS shall capture key performance data from multiple subsystems in the hybrid terrestrial/satellite architecture including remote terminal, space segment, teleport, modem/baseband, routing, wide area network, data center, and application hosting. The ENMS shall harvest, analyze and provide visualization of data to a diverse set of users/stakeholders with tactical, operational and strategic decision-making responsibilities.

CE, software, data analytics (with some EE/wireless) focus

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Micron

Project Number: 19

Project Title: **Nanofabrication and Characterization of CMOS-Compartible Hybrid Optical-Electrical Nanotransducers**

SME: Wei Zhou

Customer POC: Zuzana Steen zsteen@micron.com

Project Summary:

Design and create CMOS-compatible hybrid optical-electrical nanotransducers for the multimodal optical-electrical sensing at nano-bio interface. We will design, create, and characterize Cu- and Al-based optical nanoantennas on the top of nanopillar nanoelectrodes. These novel hybrid optical-electrical nanotransducers will allow simultaneous optical Raman sensing, electrochemical sensing, and electrical recording of cancer or neuron cultures.The general design strategy of hybrid optical-electrical nanotransducers from this project may have a broad impact on different types of lab-on-chip applications, such as environmental monitoring and biomedical detection.

MICRO/NANOSYSTEMS

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

OneWeb Satellites

Project Number: 20

Project Title: Evaluation of Dual Core Technology for Time and Space Partitioning Software Architecture

SME: tbd

Customer POC: Pierre Morere, pierre.morere@airbus-oneweb.com

Project Summary:

The project will provide a demonstration of the opportunity to use dual-core technology (Cortex A9) for application based on the current AOS (Airbus OneWeb Satellites) satellite solution using a time and space partitioning hypervisor

- Define and provide development environment for a standalone application development
- Port a IP Stack on the new processor (optional part based on progress of the above activities)

This project will be an international multi-cultural project with a team composed of students from Virginia Tech and ENSEEIHT, Toulouse, France

Embedded SW development in C

Gino

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH

Cyber Range

Project Number: 21

Project Title: CTF In-a-box

SME: tbd

Customer POC: Dr. David Raymond, Director, Va Cyber Range

Project Summary:

This project will analyze, design, and build a configurable, portable, wireless “network in a box” solution to host Capture the Flag (CTF) exercises. Students will develop a set of CTF exercises to demonstrate their solution. Most Jeopardy-style CTFs use packet capture files for networking challenges because many of them are remote and using packet captures is the easiest approach. The Virginia Cyber Range runs several in-person CTF competitions each year, which provides the opportunity for students to capture and analyze live network traffic as part of the CTF. At least two example problems will demonstrate live packet capture and analysis.

Networks & Cybersecurity

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH

Facilities

Project Number: 22

Project Title: SCADA Power Systems/Electronics

SME: Chen-Ching Liu

Customer POC: Rob Glenn, Director, VT Electric Services (VTES), robglenn@vt.edu, 540.231-0234

Project Summary:

VT Electric Services (VTES) is interested in expanding the capabilities and use of its SCADA system to improve reliability, restoration of service times, and other data monitoring that benefits its operations and customer service. As a proactive measure following its security audit, VTES is interested in partnering with VT experts to regularly test its security measures and remain up to date on cyber-security developments related to the electric grid. Students will evaluate current VTES SCADA system and provide industry informed, leading-edge data collection, system process, and management priorities to responsibly improve VTES's use of SCADA systems for their customers.

ENERGY & POWER ELECTRONICS

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH™

Facilities

Project Number: 23

Project Title: Advanced Metering Infrastructure (AMI)

SME: tbd

Customer POC: Rob Glenn, Director, VT Electric Services (VTES), robglenn@vt.edu, 540.231-0234

Project Summary:

VT Electric Services (VTES) seeks a student team to research, evaluate, and recommend an 'advanced metering infrastructure' (AMI) to integrate smart meters, data management, and communications networks to enable two-way communications between the utility and its customers. VTES has not yet implemented a 'smart meter' system for its retail customers (residential, commercial, and industrial) in the Town of Blacksburg but seeks to ensure VTES customers are provided with meter technology that provides true value and enhanced customer service options that justifies the cost of the AMI system.

ENERGY & POWER ELECTRONICS

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

TELEDYNE HASTINGS INSTRUMENTS

1 or 2 will be executed

Project Number: 24

Project Title: Remote Monitoring Vacuum Levels in Cryogenic Storage Tanks

SME: tbd

Customer POC: Doug Baker, dbaker@teledyne.com

Project Summary: Objective for this project is to develop a remote monitoring module for vacuum level measurement based on the Teledyne Hasting's DV-6R vacuum gauge tube. Ideally, the cryotank user will be able to contact the DV-6R sensor module and sample data real time; but the reality is that this approach may not be in the power budget so some form of periodic status reporting from the sensor may be preferred. Since the HPM-4/5/6 handheld will not be used, a source of power (battery or solar) will need to be selected and integrated into the module. The provided solution should recognize that the cryotank customer community will drive the actual frequency of reporting, so this should be a tunable parameter with some analysis of the tradeoffs in performance, battery life, and costs provided to the customer.

tbd

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

TELEDYNE HASTINGS INSTRUMENTS

1 or 2 will be executed

Project Number: 25

Project Title: Design & Implement a Remote Monitoring Capability for Vacuum Gauge Tubes

SME: tbd

Customer POC: Doug Baker, dbaker@teledyne.com

Project Summary:

Objective for this project is to develop a Bluetooth converter module that can be mounted directly on the newly released HVG-2020 vacuum gauge.

The HVG-2020 is a microprocessor-based vacuum gauge that is often connected via a 9-pin D-Sub. Two of the pins of this connector provide TTL level serial communication. Commands and responses are made up of a simple ASCII command set. Ideally during a poll sequence, the Bluetooth module would receive a short ASCII string query, convert to TTL levels, deliver the resulting TTL string to the HVG's microprocessor, and then transmit the corresponding response from the HVG-2020 wirelessly to the end user.

tbd

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Project Number: 26

Project Title: Magnetic Suspension System (1 of 4)

SME: Dan Sable

Customer POC: Dan Sable, sable@vptpower.com

Project Summary:

The goal of this project is to design and demonstrate a magnetic suspension system whereby an object attached to a permanent magnet is suspended vertically in air by controlling the current through an electro-magnet placed above the object. Multiple electro-magnets are then employed to move the object horizontally as well.

ENERGY & POWER ELECTRONICS (These teams to take ECE4205 concurrent w/ ECE4805)

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Project Number: 27

Project Title: Magnetic Suspension System (2 of 4)

SME: Dan Sable

Customer POC: Dan Sable, sable@vptpower.com

Project Summary:

The goal of this project is to design and demonstrate a magnetic suspension system whereby an object attached to a permanent magnet is suspended vertically in air by controlling the current through an electro-magnet placed above the object. Multiple electro-magnets are then employed to move the object horizontally as well.

ENERGY & POWER ELECTRONICS (These teams to take ECE4205 concurrent w/ ECE4805)

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Project Number: 28

Project Title: Magnetic Suspension System (3 of 4)

SME: Dan Sable

Customer POC: Dan Sable, sable@vptpower.com

Project Summary:

The goal of this project is to design and demonstrate a magnetic suspension system whereby an object attached to a permanent magnet is suspended vertically in air by controlling the current through an electro-magnet placed above the object. Multiple electro-magnets are then employed to move the object horizontally as well.

ENERGY & POWER ELECTRONICS (These teams to take ECE4205 concurrent w/ ECE4805)

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Project Number: 29

Project Title: Magnetic Suspension System (4 of 4)

SME: Dan Sable

Customer POC: Dan Sable, sable@vptpower.com

Project Summary:

The goal of this project is to design and demonstrate a magnetic suspension system whereby an object attached to a permanent magnet is suspended vertically in air by controlling the current through an electro-magnet placed above the object. Multiple electro-magnets are then employed to move the object horizontally as well.

ENERGY & POWER ELECTRONICS (These teams to take ECE4205 concurrent w/ ECE4805)

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH™

ECE

Project Number: 30

Project Title: Heartbeat - Recording & Transmission Device

SME: Jaime De La Ree

Customer POC: tbd

Project Summary:

Design, construct, test, and deliver solution that includes a circuit and control software to record and transmit a human heartbeat to medical professional suitable for review and characterization. The students develop an understanding of the factors considered critical or important in analyzing a heartbeat. The provided solution will balance fidelity with capacity for storage and transmission.

ENERGY & POWER ELECTRONICS

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™

Project Number: 31

Project Title: Stabilized Phased-Array Beamforming Using Inertial Measurement Unit Feedback

SME: tbd

Customer POC: Mike Jones, Michael.Jones@analog.com

Project Summary:

Develop, build, and test a stabilized phased-array subsystem reference design which incorporates an inertial measurement unit (IMU) for detecting the angle, acceleration, and general movement of an eight-beam X-band transmitter radio system. As part of the scope, design and include a linear antenna array attached to two beamformers (such as the ADAR1000), an X-band up-converter RF block, and a digital-to-analog converter (DAC) to generate the output signal. Use a microprocessor and DAC to both transmit the signal to be beamformed, detect the system's movement using the IMU, and then re-steer the beam to the desired angular direction using the beamformer integrated circuit (IC) with the subsystem positioned at a different physical angle. This type of system can be used on jets, ships, or other moving vehicles which require stable radio communication. The project is intended to be multi-disciplinary, and includes disciplines such as antenna design (using EM simulation tools), microwave/RF radio development, microprocessor software control, digital signal processing (DSP), and electro-mechanical development.

tbd

Toby

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH

ECE

Project Number: 32

Project Title: Coin Visual Detection and Selection System

SME: Creed Jones, crjones4@vt.edu

Customer POC: Luke Lester, lflester@vt.edu

Project Summary:

The objective of this project is to design, build, and test a coin detector and selector device. The system will use visual object recognition and machine learning techniques to identify and select more valuable coins from a set of coins on a flat surface.

Controls, Robotics & Autonomy; Machine Learning, Photonics

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH

ECE

Project Number: 33

Project Title: Reliability and Robustness Test Platform for Wide-Bandgap Power Devices

SME: Yuhao Zhang

Customer POC: Yuhao Zhang, yhZhang@vt.edu, (540) 231-9845

Project Summary:

This project aims to build a unified, multi-functional test systems for the reliability and robustness characterization of wide-bandgap power devices. The project will produce a test system including circuit boards and automation controls. The project highlights a combination of circuit design, automation implementation and device understanding.

ENERGY & POWER ELECTRONICS, Automation, Circuit design

Scot

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

VIRGINIA TECH

ECE

Project Number: 34

Project Title: International Future Energy Challenge - 2020

SME: Jih-Sheng (Jason) Lai

Customer POC: Jih-Sheng (Jason) Lai, laijs@vt.edu

Project Summary:

This competitive project aims to build build satellite power supply. The International Future Energy Challenge is an international student competition for innovation, conservation, and effective use of electrical energy. The competition is open to college and university student teams from recognized engineering programs in any location. Participation is on a proposal basis.

Space Systems, Power Energy, Circuit design

Scot

Move to
Spring 2020

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

TRIDENT

Project Number: NA

Project Title: Multi-modal, simultaneous RF systems

SME: Michael Buehrer (tbv)

Customer POC: Dan Hibbard, Trident Systems, daniel.hibbard@tridsys.com

Project Summary:

Trident Systems, INC (Trident) has developed a SDR architecture and associated hardware, firmware and software to implement several of these RF modalities, including radar, communications, and signal reception. There is great interest to combine these modalities for simultaneous operation to address the emerging requirements from our customers for these type of systems. To that end, Trident seeks projects which demonstrate the ability to simultaneously perform two RF modalities; specifically communications and radar, utilizing the same pulsed waveform of SDR hardware.

Networking, Cybersecurity, Communications, Software Systems

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

IBM

Project Number: NA

Project Title: tbd

SME: tbd

Customer POC: Christine Whiteside

Project Summary:

tbd

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Aurora FLIGHT SCIENCES

Project Number: NA

Project Title: tbd

SME: tbd

Customer POC: Marlo Cooper

Project Summary:

tbd

Ken

Move to Fall
2020

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

Computer Engineering majors must have completed the following courses with a C- or better: 2014, 2534, 3574 and one of the following (3204 and 3274, 3004 and 3074, 3544, 3614, 3704, 3714, 4424, 4704, CS 3214, CS 4254).

Project Sponsor:

Texas Instruments

Project Number:

Project Title: IoT Development board

SME: Peter Han

Customer POC: Mark Easley, measley@ti.com

Project Summary:

This project will focus on building an Internet of Things focused development board using the CC1352R microcontroller that incorporates BLE and Sub-1GHz radios. This board can act as a gateway network processor for another development board or function standalone as a wireless microcontroller. The project will require a mix of hardware and software skills to design the PCB and out of box software examples. The team can choose to add additional sensors, actuators, or integrated circuits to the PCB to make the board more capable for its chosen use cases, which could include attachment to a BeagleBone or RasPi, attachment to the TI-RSLK robot, Feather board prototyping, and more.

Software Systems, CONTROLS, ROBOTICS AND AUTONOMY,

Ken

Bradley Department of Electrical & Computer Engineering

Two Semester Major Design Experience (MDE)

4805/6 Required Prerequisite:

Electrical Engineering majors must have completed the following courses with a C- or better: 2014, 2534, and any 2 of the following courses (3105, 3204, 3304, 3614, 3704).

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Project Sponsor:

VIRGINIA TECH

ECE

Project Number: 29

Project Title: SCADA Power Systems/Electronics

SME: Jaime De La Ree

Customer POC: tbd

Project Summary:

tbd

ENERGY & POWER ELECTRONICS

Scot