Luke Rumbaugh, Ph.D.

Assistant Professor of Electrical and Computer Engineering

GROVE CITY COLLEGE
ESTABLISHED 1876 · PENNSYLVANIA

Teaching

- Communications
- Signals
- Circuits lab
- Digital logic lab
- Microcontrollers
- Senior design

- Data Comms/Networking
- Mechatronics
- Computer Vision

Student Projects

- 3D imaging
- Machine learning
- Electric propulsion
- UVC sanitization

Research & Consulting

- Time of flight cameras
- Optical processing
- Electromagnetic sensors

JOHNS HOPKINS APPLIED PHYSICS LABORATORY

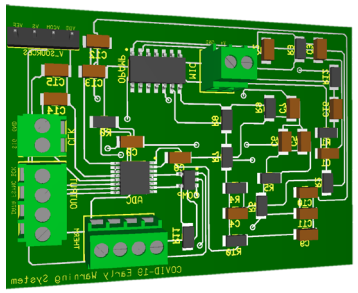
b,h Stantec

Clarkson University · Clarkson™

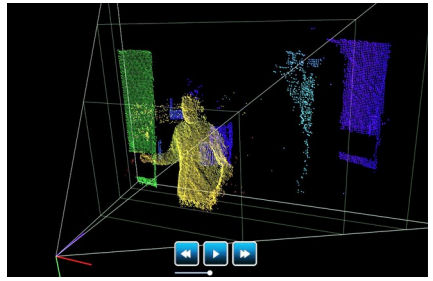
Office of Naval Research · Science & Technology

Naval Air Systems Command

Hands-on student projects



Project-based labs



Student involvement in research

GROVE CITY COLLEGE

James D. Brooks, Ph.D.

Associate Professor of Electrical and Computer Engineering

Grove City College
Established 1876 · Pennsylvania

Teaching

- Controls I & II
- Decision Analysis
- Circuits II
- System Simulation
- Foundations of Systems Engineering
- Senior Design

Student Projects

- Industrial Automation
- Human Trust in Automation

Research & Consulting

- Automation (freight rail, building)
- Hybrid vehicles

Georgia Institute of Technology

Rensselaer

GE Transportation

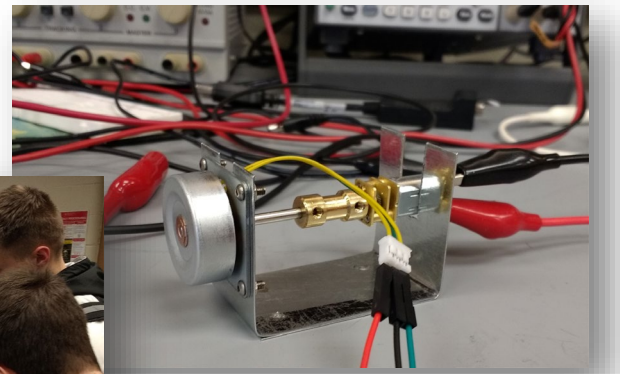
Department of Transportation, United States of America

GE Research

Wabtec Corporation

Grove City College

Engaging Underclassmen in Senior Design



New 3-Phase Power Labs

Rail Automation Human Study

Independent Studies in ECE

Unique opportunities for technical & personal growth

GROVE CITY COLLEGE

Goal:

- Shape students' engineering identity through projects that students own and drive

Objectives:

- Create student interface with practicing engineers
- Engage students at all levels
- Give students progressive growth through small→big success in low→high risk projects

Status:

- About 30 students engaged in 2019-20 (sophomore through senior)
- Very positive response feedback from both students and external partners

Looking for win-wins:
We would love to partner with you

Faculty Research

- External collaborators, sponsors
- Publications & conferences

GE Research

Naval Air Systems Command

Department of Transportation United States of America

Clarkson University

Clarkson

Customer-Defined Projects

- First prototypes for industry
- Student design competitions

Liberty Electronics

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Wabtec Corporation

NASA

Curriculum Extension

- Technology for classes & labs
- Special topics of student interest
- Groundwork for senior design projects

Uber

AEROTECH

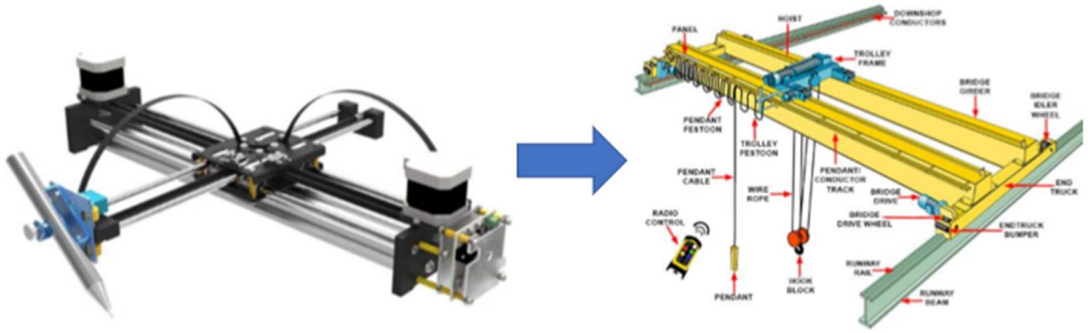
INDEPENDENT STUDIES IN ECE

UNIQUE OPPORTUNITIES FOR TECHNICAL & PERSONAL GROWTH

GROVE CITY COLLEGE

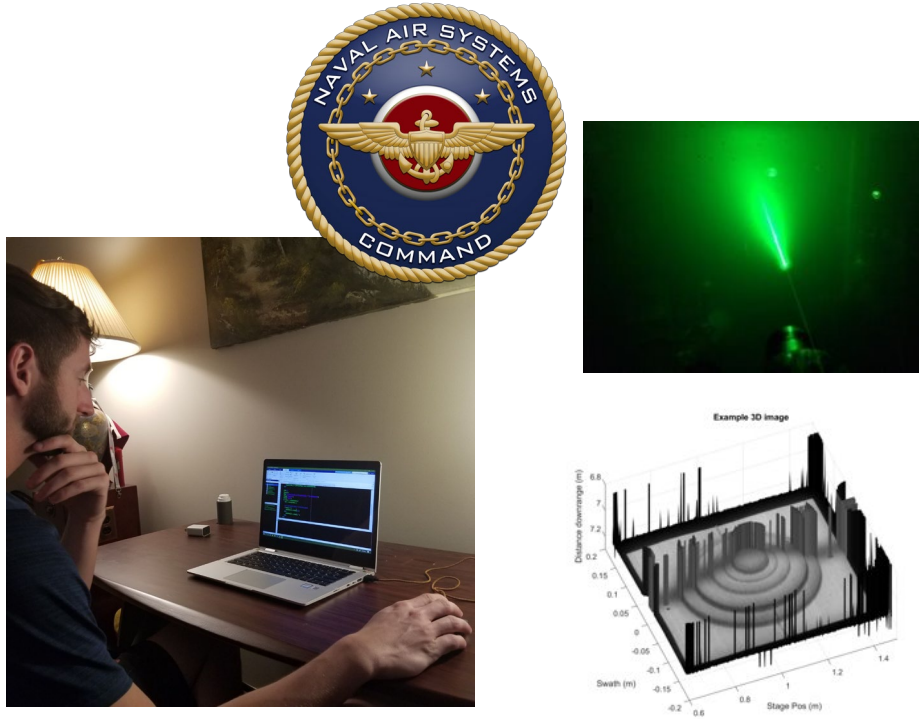
Faculty Research

- External collaborators, sponsors
- Publications & conferences



Dr. Brooks – ELEE 270 – Exploring Human Trust in Automation – 2 EE students:

Students worked to develop a crane system (by repurposing an open-source plotter) for exploring how control system design impacts an operator's trust. They also helped plan human subject trials which will take place virtually this summer and in person in the Fall. One student will continue this work through the summer with a Swezey grant.



Dr. Rumbaugh (& Dr. Hutchins) – ELEE 370 – Machine learning for target detection in underwater lidar – 5 EE and 3 CS students:

Jacob Brother prepares to present his team's findings to a Navy sponsor. The team trained a machine learning system to detect targets for an underwater lidar system.

INDEPENDENT STUDIES IN ECE

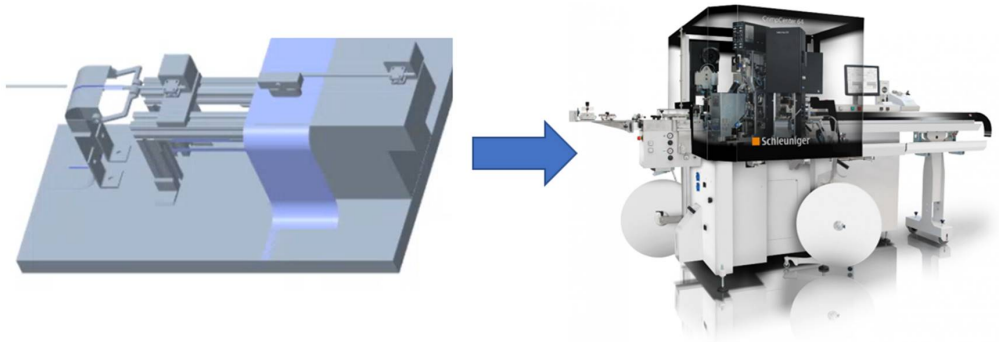
UNIQUE OPPORTUNITIES FOR TECHNICAL & PERSONAL GROWTH

GROVE CITY COLLEGE

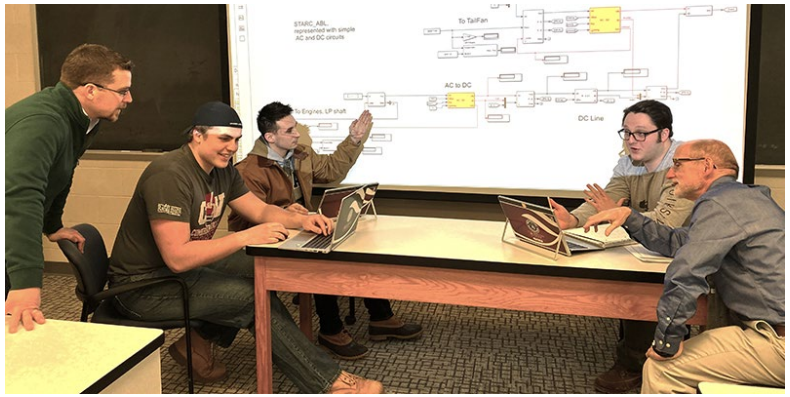
Customer-Defined Projects

- First prototypes for industry
- Student design competitions

Liberty Electronics



Dr. Brooks – ELEE 360 – Automated wire-labeling machine – 2 EE and 1 ME students:
Liberty Electronics asked students to develop an automating wire-labeling machine. Students will demonstrate their first prototype system after businesses re-open.



Dr. Rumbaugh (& Dr. Richards) – ELEE370 – Electric Aircraft Propulsion – 3 EE and 1 ME students:
NASA Glenn Research Center hosted a student design competition. Students developed a cooling and control system for the electric motor at the back of NASA's prototype hybrid aircraft.

NASA

Oniris
ÉCOLE NATIONALE VÉTÉRINAIRE, AGROALIMENTAIRE ET DE L'ALIMENTATION
SANTÉ ET ALIMENTATION AU CŒUR DE LA VIE

Dr. Bright (& Dr. Bardy)– ELEE 360 – Electrohydrodynamic experiment apparatus – 1 EE student

Independent Studies in ECE

Unique opportunities for technical & personal growth

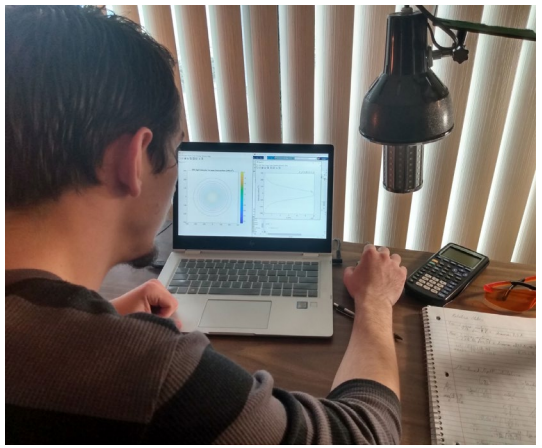
GROVE CITY COLLEGE

Curriculum Expansion

- Technology for classes & labs
- Special topics of student interest
- Groundwork for senior design projects

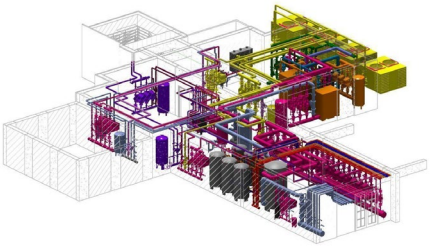
Dr. Mohr – ELEE 360/460 – High resolution GPS for robot localization – 3 EE students:

Theo Stangebye tests the range and resolution on his GPS-RTK setup in the New Mexico sunshine. The team achieved sub-centimeter GPS resolution over a campus-sized area using a base/rover configuration and a custom 900 MHz radio backlink.



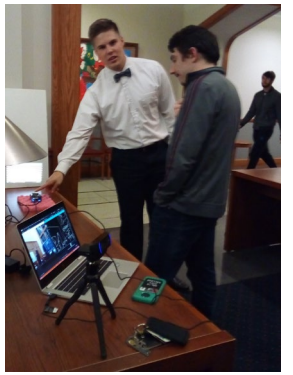
Dr. Rumbaugh – ELEE 260 – UVC light sterilization kit for home use – 4 EE students:

Joseph Lovin looks over lighting calculations for the ultraviolet (UV-C) sterilization bulb installed at his desk. Students performed design for a 265 nm DIY sterilization kit that could be built at home.



Dr. Christman – ELEE 460 – REVIT building modeling software – 1 EE and 1 ME student

Dr. Bright – ELEE 460 – Force plate sensing – 1 EE student

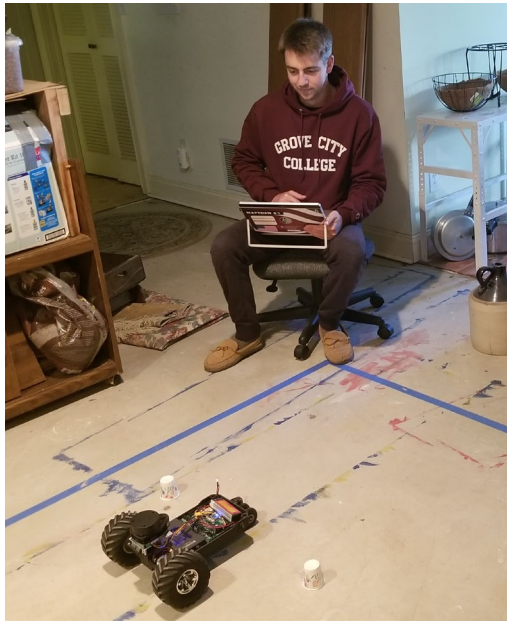


Dr. Rumbaugh – ELEE 260 – 3D imaging using structured light – 2 EE students

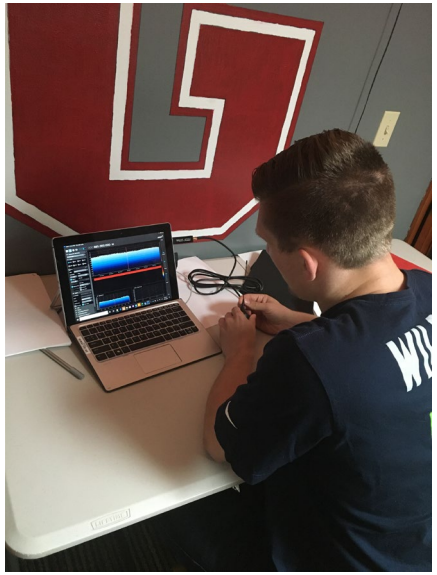
GCC EE Response to COVID-19

Images from the diaspora

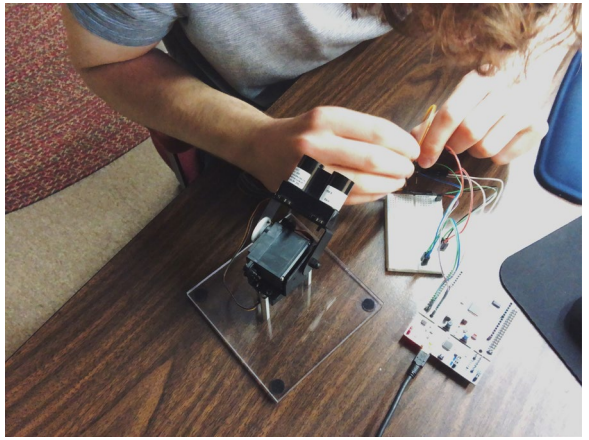
Keeping the Lights On Remotely



Dr. Mohr's ROBO 302 Mobile Robots:
A GCC robot navigates student Zach Blaskewicz's basement, as it uses its lidar to navigate obstacles and mark waypoints.



Dr. Rumbaugh's ELEE 432 Communications II:
Noah Peternel tunes a software-defined radio (SDR) antenna as he tracks signals from aircraft passing by his home office.



Dr. Rumbaugh's ELEE 310 Microcontrollers:
Thomas Clement gets his scanning lidar system ready to take a 3D point cloud image of a room.

Dr. Mohr's ELEE 210 Mechatronics:
Jared Hurd demonstrates digital control of a DC motor over a video call from his home.

GCC EE Response to COVID-19

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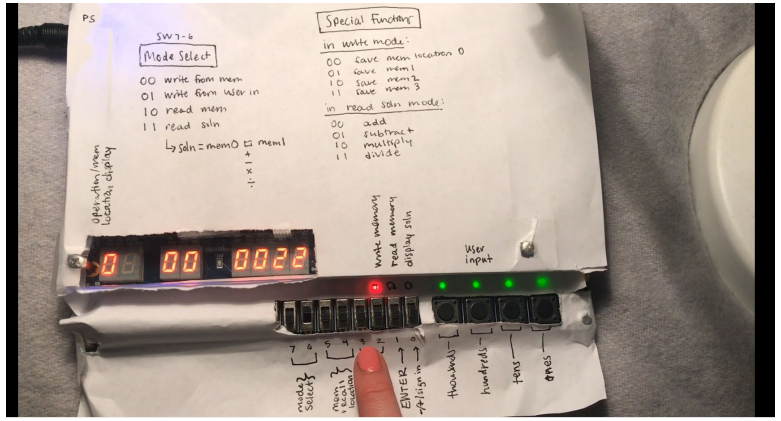
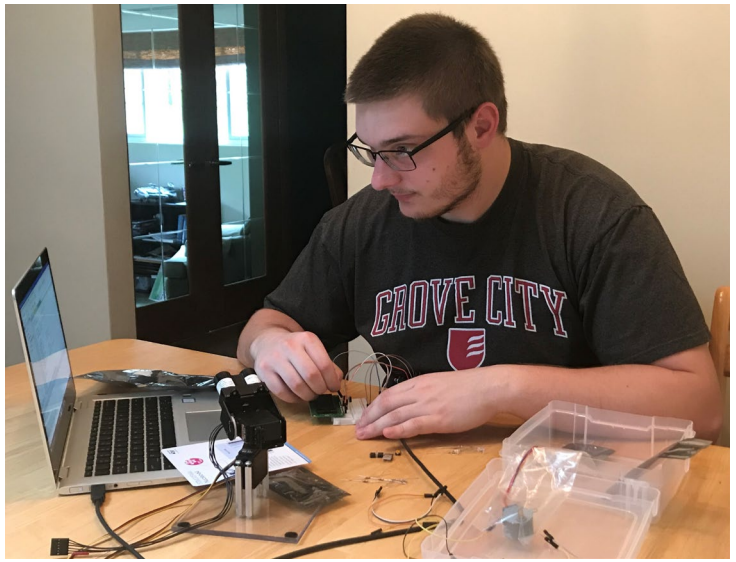
Keeping the Lights On Remotely



Dr. Bright's ELEE 204 Digital Logic:
Emma Bentz demonstrates over video how her team used their FPGA boards to build a digital calculator.

Students brought their boards home from GCC and used them for labs in March and April.

ELEE 452 Senior design project):
Joshua Harhai shows off the electronics enclosure he built in his yard after being sent home. This enclosure completed his team's water tank setup for testing of their camera.

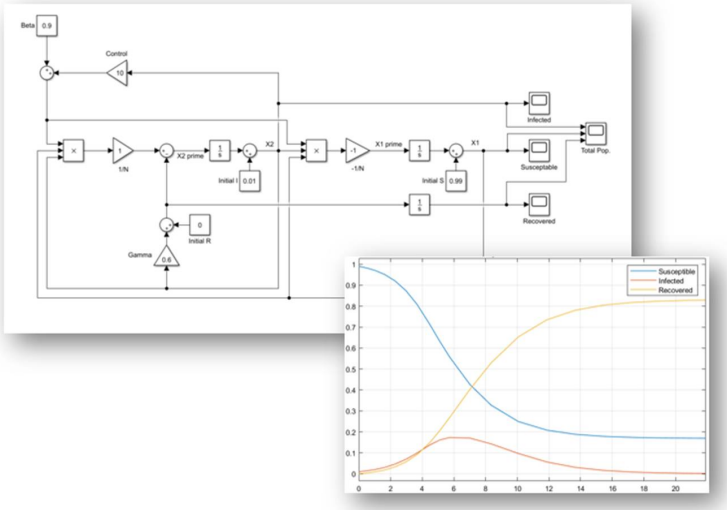


Dr. Rumbaugh's ELEE 310 Microcontrollers:
Andrew Wisniewski uses the electronics kit he took home when he left campus. Students performed labs together over video chat.

GCC EE Response to COVID-19

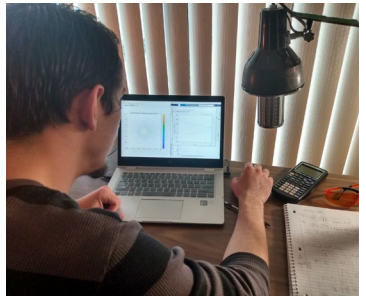
Images from the diaspora

Responding as Engineers

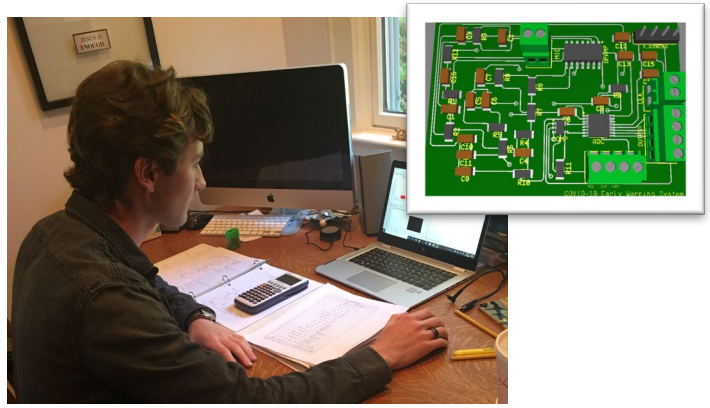


Modeling the spread of COVID-19 through a population (ELEE 422 Controls II):
Students used a cybernetics model to predict the number of infections (red) and recoveries (yellow) over time for various lockdown scenarios.

3D printing face shields for healthcare workers:
Theo Stangebye tries out a face shield he printed for firefighters in his town in New Mexico. Other EE faculty and staff printed shields for healthcare workers at nursing homes and other facilities in Grove City.



Designing a UVC sterilization kit (ELEE 260 Independet Study):
Joseph Lovin looks over lighting calculations for the ultraviolet (UV-C) sterilization bulb installed at his desk.



Designing a wearable "Coronavirus early-warning system" (EE321 Signals and Systems):
Cory Toribio checks the outputs from his wearable device design. Students designed circuit boards to track vulnerable patients' temperature and lung sounds. They wrote signal processing software to decide if the lungs were likely healthy or infected.